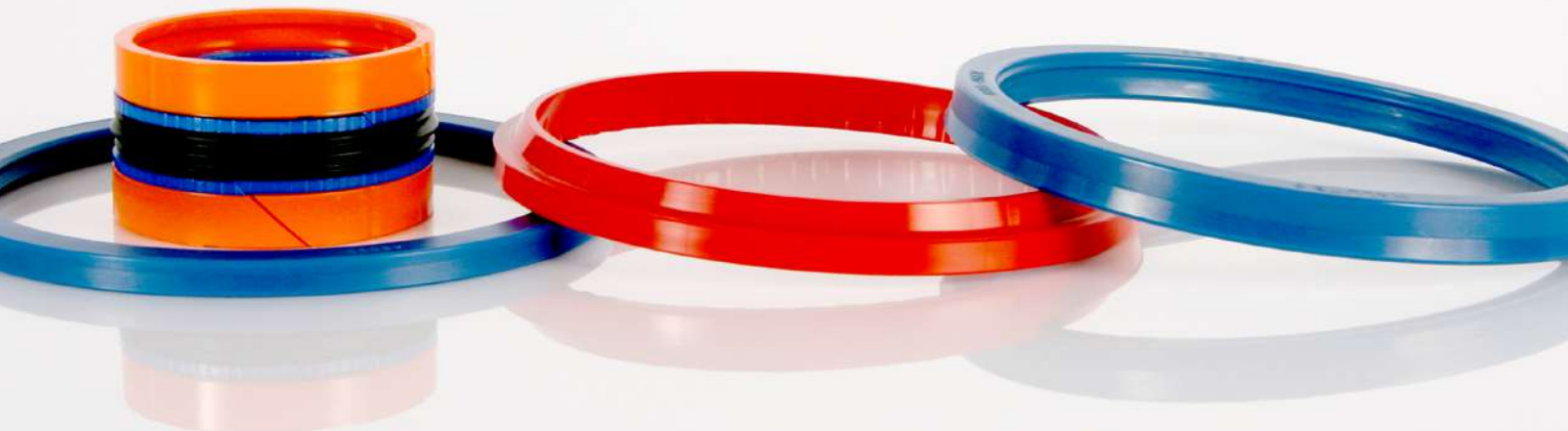




HALLITE

FLUID POWER SEAL CATALOG

INCH AND PNEUMATIC EDITION



HOW TO USE THIS CATALOGUE

Within the next few pages you'll find an introductory section of technical data to assist you with seal selection including information about our materials.

On each product datasheet we will provide you with the technical details of that particular product along with size listings where applicable. Parts suitable for ISO standard housings and Asian housings are clearly identified within each product part number range.

A product index by function and size is included in the yellow paged section.

The information contained within this catalogue is based on many years of fluid sealing experience, along with extensive in-house testing and is given in good faith. No warranty or guarantee is expressed save in our standard terms and conditions of sale (available upon request) since the conditions of use are beyond our control.

Hallite is continuously improving our range of profiles and sizes. We reserve the right to withdraw or modify any item shown in this catalogue. For the most up-to-date size and part listings, please visit our website at www.hallite.com and contact your nearest Hallite sales office or official Hallite distributor for further information.

LEGAL LIABILITIES

All descriptions, design and performance information, and recommended uses for the products described herein are based generally on our design and manufacturing experience, product testing in specific conditions, and industry standards. The catalogue is for general guidance only, does not constitute professional advice or a guarantee or warranty of design or warranty of performance and should not be relied upon or treated as a substitute for specific consideration and advice relevant to particular circumstances. The information provided herein is provided "as is," and we reserve the right to make product changes from time to time, without prior notification, which may change some of the information provided herein. Hallite and its affiliated companies disclaim all express and implied warranties with regard to the information, materials, and opinions contained in this brochure, including without limitation implied warranties of merchantability, fitness for a particular purpose, compatibility, and non-infringement. All warranties applicable to Hallite products are found exclusively in the terms and conditions of sale, as stated in sales contracts related to the sale of such products.

Each purchaser of such products must decide if the products are suitable to the intended use of such purchaser. This edition supersedes all previous brochures.

CONTENTS

TRIED AND TRUSTED - HALLITE	4
THE HALLITE WAY	5
MAJOR INDUSTRIES	5
HALLITE SEAL DESIGN AND SELECTION INDEX ..	6
LEGACY PRODUCTS - INCH	9
ARMORLENE® PTFE FLUID POWER SEALS PORTFOLIO	10
HALLITE SERVICE® MACHINED SEALS	11
GLOBAL QUALITY CERTIFICATION	14
MANUFACTURING LOCATIONS	15
MATERIAL CHART	16
FLUID COMPATIBILITY CHART	18
USE & FITTING OF SEALS	20
CYLINDER OPERATING CONDITIONS	21
CYLINDER HOUSING AND SEAL OPTIONS	23
SPECIFIED TOLERANCE TABLES	26
BEARING MATERIALS AND DIMENSIONAL TOLERANCES	27
HOUSING DESIGNS AND EXTRUSION GAPS	28
HOUSING DESIGNS	29
STORAGE OF SEALS	30
SURFACE FINISH	31
DOUBLE-ACTING PISTON SEALS	
714	37
754	41
755	45
764	51
770	55
775	59
780	63
SINGLE-ACTING PISTON SEALS	
606	69
659	77
SINGLE-ACTING ROD AND PISTON SEALS	
500 SERIES	83
511	85
512	97
513	107
601	125
UNITIZED PISTON	
720	133
ROD SEALS	
605	139
620	155
621	159
622	167
658	171
ROD BUFFER SEALS	
653	177
WIPERS	
520	183
521	189
820	195
842	199
860	203
862	207
BEARINGS	
506	213
533	223
PNEUMATIC SEALS	
607	233
609	237
661	241
667	245
851	249
853	253
ADDITIONAL PRODUCTS	
657	259
O-RING PAGE	263
OTHER BACKUP-RINGS	265
PRODUCT INDEX	
INCH	269
LEGACY INCH	307



TRIED & TRUSTED

For over 100 years,

Hallite has been a leading supplier and pioneer of high-quality fluid sealing technologies and engineered sealing solutions. As a global organization with a keen focus on worldwide delivery through regional manufacturing sites and fabrication centers, we are able to leverage our expertise in engineering design, superior quality, and advanced manufacturing and production processes to meet your supply needs when and where you need them the most. From high-volume production runs to bespoke sealing solutions, the longevity of our success in meeting the demands of OEMs, distributors and aftermarket specialists can be attributed to doing things the "Hallite Way." We bring to market a blend of cataloged and fit-for-purpose, quality products that offer cost-effective performance. Over the years, we have refined our business approach to provide services to our customers that are searching for both engineered solutions and off-the-shelf products from a single-source supplier.

We are constantly adding to our range of profiles and sizes for ISO standard and Asian housings. Please review the product catalog for a complete list of products or contact your nearest Hallite sales office or official Hallite distributor for further information.

THE HALLITE WAY

Whatever You Need, We Can Help

A robust portfolio of cataloged products and value-added engineering and manufacturing services that meet and exceed customer needs and expectations.

One High Standard, Everywhere

A commitment to global quality and production standards that ensure consistency everywhere in the world.

Service As Reliable As Our Seals

A dedication to getting it done right and on time — the first time. Ensuring products and value-added services are delivered on time and to exact specifications.

● ● ● MAJOR INDUSTRIES

- Agriculture
- Chemical Processing
- Construction & Forestry
- Food & Beverage
- General Industry
- Hydro-Power
- Injection Molding
- Machine Tools
- Marine
- Material Handling
- Mining & Mineral Extraction
- Mobile Hydraulics/Off-Highway
- Oil & Gas
- Steel & Aluminum Processing
- Transportation

HALLITE SEAL DESIGN AND SELECTION INDEX

PROFILE DESIGNATION	Page	Profile	Maximum Pressure psi	Temperature Range °F	Maximum Speed ft/sec
DOUBLE-ACTING PISTON SEALS					
714	37		7500	-40°F +230°F	3.0
754	41		5000 7500*	-40°F +230°F	3.0
755	45		5000	-40°F +230°F	3.0
764	51		3600	-22°F +230°F	3.0
770	55		5000	-40°F +230°F	3.0
775	59		5000	-22°F +230°F	3.0
780	63		6000	-22°F +212°F	1.5
NOTE	*Pressure rating of seal design can be extended by the use of a face seal in TPE 051 material. If this option is required, please seek advice from your local Hallite office.				
SINGLE-ACTING PISTON SEALS					
606	69		6000 10000*	-50°F +230°F	3.0
659	77		6000	-50°F +230°F	3.0
NOTE	*Pressure rating of seal design can be extended by the use of a back-up ring. If this option is required, please seek advice from your local Hallite office.				
SINGLE-ACTING ROD AND PISTON SEALS					
511	85		5000	-40°F +230°F	1.5
512	97		5000	-40°F +230°F	1.5
513	107		5000	-40°F +230°F	1.5
601	125		6000 10000*	-50°F +230°F	3.0
NOTE	*Pressure rating of seal design can be extended by the use of a back-up ring. If this option is required, please seek advice from your local Hallite office.				
UNITISED PISTON					
720	133		5000	-22°F +212°F	3.0

HALLITE SEAL DESIGN AND SELECTION INDEX

PROFILE DESIGNATION	Page	Profile	Maximum Pressure psi	Temperature Range °F	Maximum Speed ft/sec
ROD SEALS					
605	139		6000 10000*	-50°F +230°F	3.0
620	155		6000	-50°F +230°F	3.0
621	159		10000	-50°F +230°F	3.0
622	167		6000	-50°F +230°F	3.0
658	171		6000	-50°F +230°F	3.0
NOTE	*Pressure rating of seal design can be extended by the use of a back-up ring. If this option is required, please seek advice from your local Hallite office.				
ROD BUFFER SEALS					
653	177		10000	-50°F +230°F	3.0
WIPERS					
520	183		-	-50°F +230°F	12.0
521	189		-	-50°F +230°F	12.0
820	195		-	-50°F +230°F	12.0
842	199		-	-50°F +230°F	12.0
860	203		-	-40°F +212°F	3.0
862	207		-	-40°F +212°F	3.0
NOTE	Additional wiper seals are available upon request in metric sizes and include ranges for ISO and Asian housings. The 521 wiper is produced in a material capable of operating at temperatures below 32°F but is not designed to scrape ice.				
BEARINGS					
506	213		-	-40°F +250°F	16.0
533	223		-	-40°F +250°F	16.0
NOTE	506 and 533 wear strips are also suitable for oscilating and rotary applications. 506 is available in three different formats: spiral lengths, cut rings, and flat coils. Additional bearings are available upon request in metric sizes.				

HALLITE SEAL DESIGN AND SELECTION INDEX

PROFILE DESIGNATION	Page	Profile	Maximum Pressure psi	Temperature Range °F	Maximum Speed ft/sec
PNEUMATIC SEALS					
607	233		230	-50°F +180°F	3.0
609	237		230	-50°F +180°F	3.0
661	241		230	-50°F +180°F	3.0
667	245		230	-50°F +180°F	3.0
851	249		150	-50°F +180°F	0.3
853	253		230	-50°F +180°F	0.3
ADDITIONAL PRODUCTS					
657	259		8500	-50°F +230°F -22°F +212°F*	Static
NOTE	*Temperature range based on material option selected.				



LEGACY PRODUCTS

Over our 110 year history, Hallite has offered a range of products to service the fluid power industry. Some of these products are still recognized as the industry standard. Some have been eclipsed by new engineering knowledge and material advances or adjusted and fine-tuned based on testing in the laboratory and in the field.

Below are our legacy products. Many of these profiles have been replaced by more modern designs. These products are still available in some regions but the tooling range may be limited. For a list of sizes, please see the legacy section of the yellow pages in the back of this catalogue.

We advise customers who still purchase these items to meet with their local sales or engineering team to discuss if there is a superior Hallite product for your application.

VEE PACK – INCH



07



09

LEGACY ROD SEALS – INCH



18

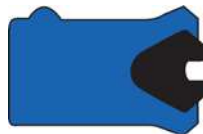
LEGACY SINGLE-ACTING PISTON SEALS – INCH



18



71



656

LEGACY DOUBLE-ACTING PISTON SEALS –



53



56



58



65



77



83

ARMORLENE® PTFE FLUID POWER SEALS PORTFOLIO

Hallite's Armorlene® PTFE portfolio has expanded the range of products we can now supply customers around the world. Developed from material and compound production expertise within Hallite and our sister companies, CDI Energy Products and EGC Critical Components, our PTFE seals come in a complete range of product profiles, forming one of the most comprehensive collections of its kind in the industry. Plus, as with all of our seals, they come with the support of our technical team to provide the advice necessary in developing tailored product solutions.

Because of the size of this new product offering, we have created a separate catalog for the Armorlene® range. Please refer to the Armorlene® PTFE catalog and our website for complete information of all technical, material, and part number range information.

ROD SEALS



716SPN



R16



RCG



RDA



RDS



SRB



SRS

PISTON SEALS



CT



G54



GP2



GPS - ROUND



GPS - SQUARE



P16



P54



PCA



PCG



PDS



PFR

WIPERS



E2W



E5W



ELA



EXF



EXG

SWIVEL SEALS



SSP



SSR

Some profile designations previously included in our standard catalog may have been superseded by new PTFE profile designations and will no longer be included in this catalog. Below are the product groups that have been affected.

NEW PROFILE DESIGNATION	SUPERSEDES LEGACY PRODUCT
CT	735
E2W	335
E5W	335
G54	54
P16	355
P54	54, 454

NEW PROFILE DESIGNATION	SUPERSEDES LEGACY PRODUCT
PFR	455
PME	90 PSTM
R16	16, 416
RDA	316
SSR	310

HALLITE SERVICE® MACHINED SEALS

In addition to our extensive range of catalog products, Hallite Service®, our quick turnaround custom machined seals department, has the ability to produce an infinite number of profiles using the latest CAD/CAM and CNC machines to produce rubber and plastic parts to the customers' drawings or by utilizing one of the 100+ computerized profiles as individual pieces or in economical small series

Many situations in the fluid power industry require an immediate response and rapid manufacturing and delivery for your urgent repair or prototyping needs. Whether you require a custom profile and material or customized solution of one of our standard profiles, we can ensure the highest quality product at an economical cost due to small batch, lower mould and tooling costs, and minimal manufacturing time. Instances where Hallite Service® benefits customers the most are:

- Machinery breakdown
- Non-standard seal dimensions
- Prototyping
- Discontinued spare parts
- Material change due to non-standard or aggressive media

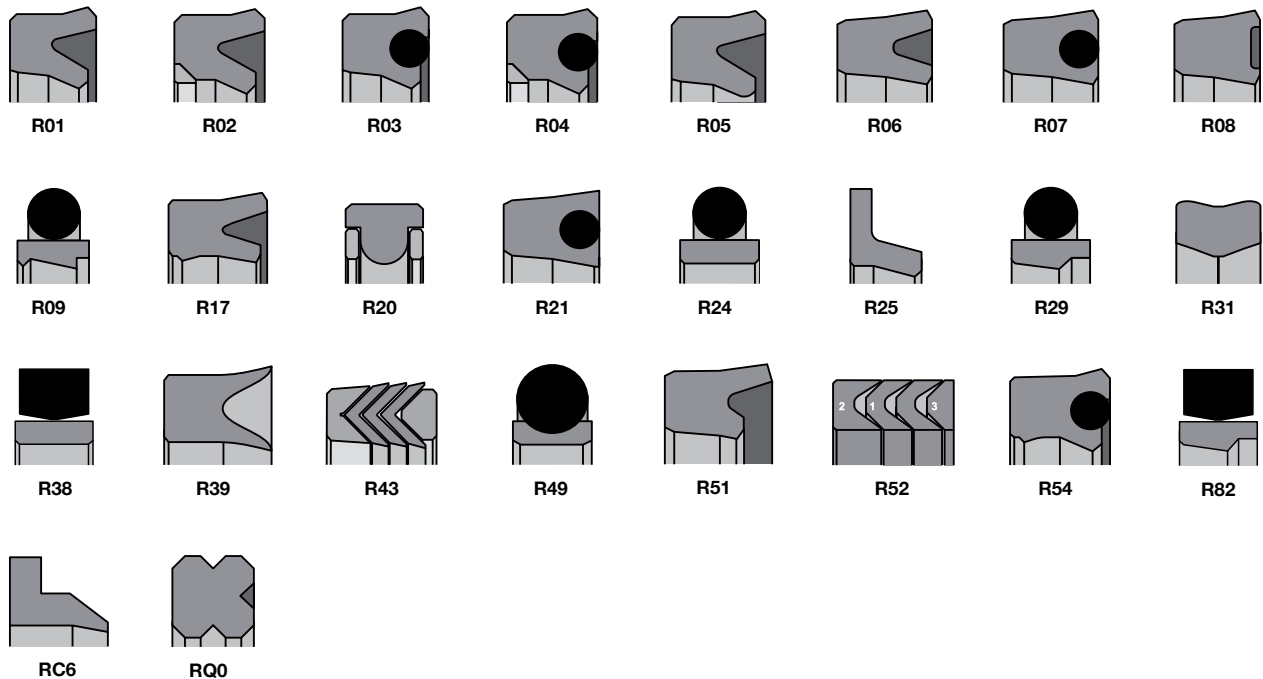
Hallite Service® products can be manufactured from 6.35 mm (0.25 in) to over 1320 mm (52.00 in) in a wide range of application-specific specialty elastomers and high performance plastics.

Hallite Service® centers are located close to customers in a number of countries in Australia, Europe, North America, and China.

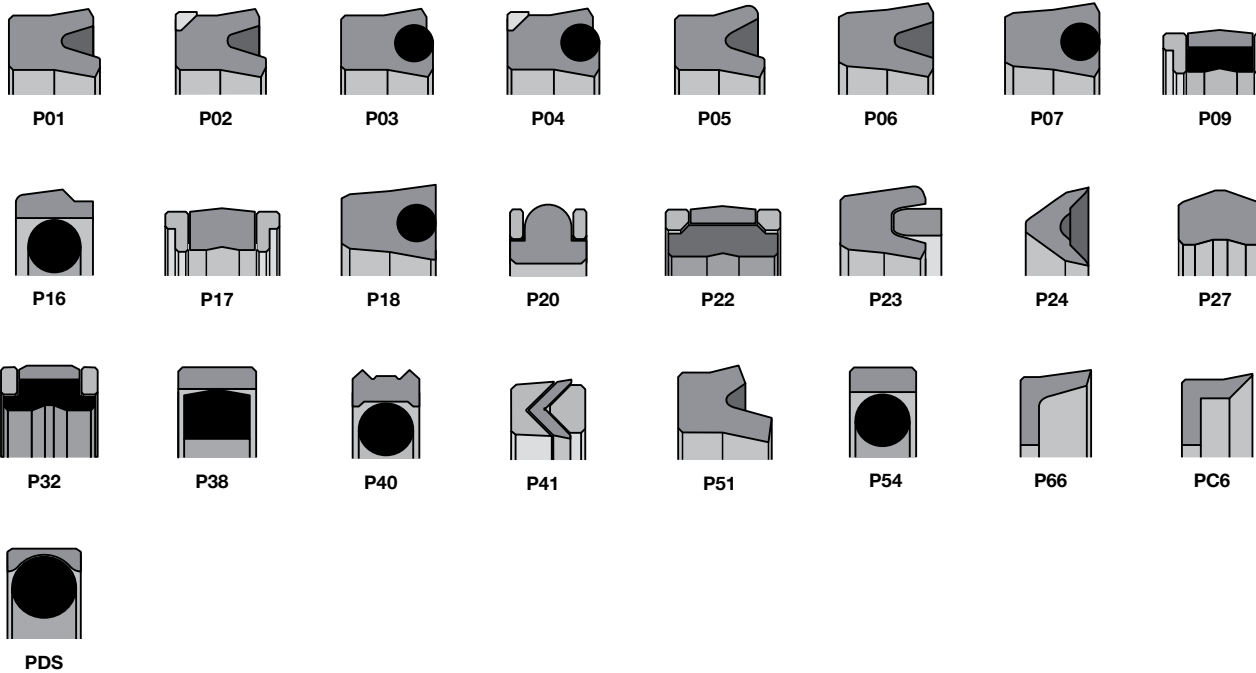
Below you can find a small selection of our vast range of custom machined parts. If you do not see the profile you need here, contact our Hallite Service® team for a complete list of machined seal profiles.

For a custom seal quotation, submit your seal specifications and requirements online at www.hallite.com/hallite-service or contact your local Hallite Service® office for a physical order form.

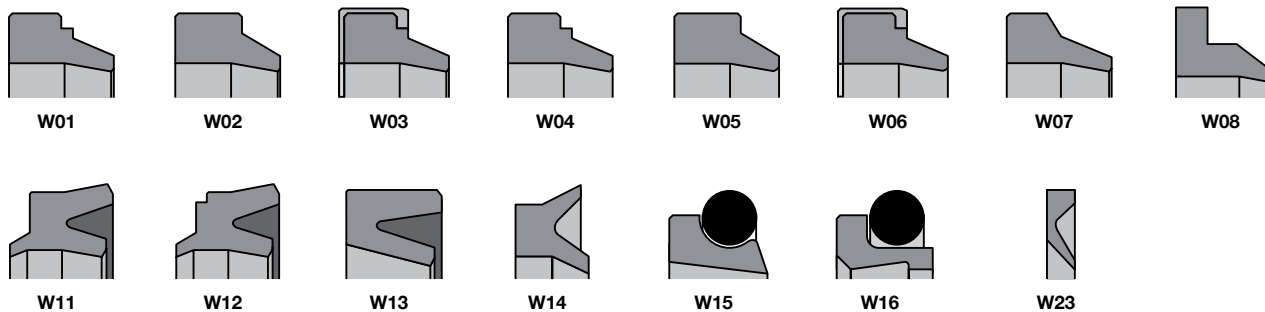
ROD SEALS



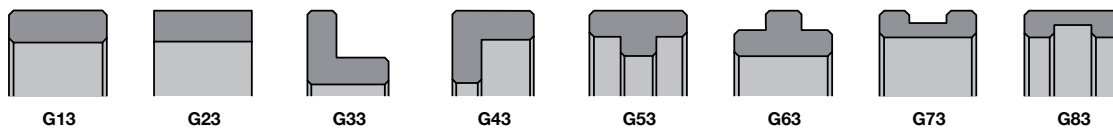
PISTON SEALS



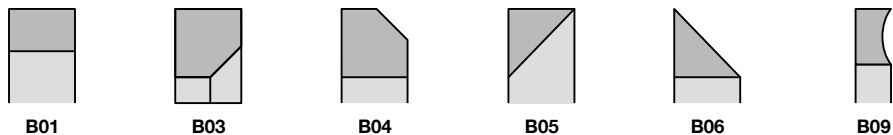
WIPERS



BEARINGS



BACK-UP RINGS



NOTE

For bearings, profiles with 30° cut angle are standard. Other angle cuts are available upon request.

For back-up rings, profile with unsplit back rings are standard. Split versions are available upon request.

ROTARY SEALS



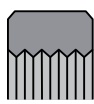
S01



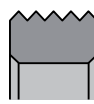
S02



S03



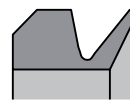
S04



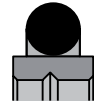
S05



S06



S07



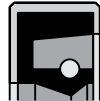
S10



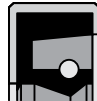
S11



S12



S21



S22



S24



S25



S26



S29

MATERIALS

Hallite Service® custom machined seals come in a variety material. Contact your local office to find out which material best suits your chosen profile and applications. These can include:

- Polyurethane
- Polyester
- NBR Rubber
- HNBR Rubber
- FPM/FKM/Viton®
- POM
- PA
- PTFE
 - Virgin PTFE
 - Bronze-filled PTFE
 - Carbon-filled PTFE
 - Glass-filled PTFE
- EPDM Rubber
- Silicon Rubber



GLOBAL QUALITY CERTIFICATIONS

It's more than simply what
we do, it's who we are.

At Hallite, quality, health, safety, and environmental concerns are more than checklist items. Our focus on QHSE is ingrained into our company culture and is an integral component of corporate responsibility. A safe, healthy work environment positions our global team to provide the highest quality, on-time delivery, and service excellence. Industry standards such as the ISO 14001, ISO 9001:2010, and the OHSAS 18001 management systems help us continually improve on all elements of QHSE while ensuring regulatory compliance.

Our commitment to QHSE comes from genuine concern about our people, our customers, the environment, and corporate responsibility. The health and safety culture at Hallite is based on personal empowerment, encouraging each employee to take personal responsibility in following the protocols and procedures that ensure QHSE compliance.



MANUFACTURING FACILITIES WITH QHSE CERTIFICATIONS

WIXOM, MI, USA	• ISO 9001 Quality • ISO 14001 Environmental • OHSAS 18001 Health and Safety	HAMBURG, GERMANY	• ISO 9001 Quality • ISO 14001 Environmental • OHSAS 18001 Health and Safety
TORONTO, ON, CANADA	• ISO 9001 Quality	BANGALORE, INDIA	• ISO 9001 Quality • ISO 14001 Environmental
HAMPTON, UK	• ISO 9001 Quality • AS 9100 Aerospace Quality • ISO 14001 Environmental • OHSAS 18001 Health and Safety	JIADING, SHANGHAI, CHINA	• ISO 9001 Quality • OHSAS 18001 Health and Safety
LIVORNO, ITALY	• ISO 9001 Quality	AUSTRALIA	• ISO 9001 Quality

OTHER DIVISIONAL MANUFACTURING SITES

CDI ENERGY PRODUCTS	• Houston, TX, USA • Singapore • Leeds, UK • Stavanger, Norway • Hampton, UK
EGC CRITICAL COMPONENTS	• Houston, TX, USA
AIP PRECISION MACHINING	• Daytona Beach, FL, USA

MATERIAL CHART

Hallite has an extensive portfolio of materials and not all materials are listed below. If your application requires alternative materials or if you're unsure which material best suits your application, please contact your local Hallite team.

MATERIAL NAME	MATERIAL GROUP	MATERIAL TYPE	TEMPERATURE RANGE °C (INTERMITTENT)	TEMPERATURE RANGE °F (INTERMITTENT)	
Hythane® 181	Polyether Urethane	TPU-EU	-45 +110	-50 +230	
Hythane® 221	Polyether Urethane	TPU-EU	-45 +110	-50 +230	
Hythane® 251	Polyether Urethane	TPU-EU	-45 +110	-50 +230	
Hythane® 321	Polyester Urethane	TPU-AU	-40 +100	-40 +212	
Hythane® 361	Polyester Urethane	TPU-AU	-30 +110	-22 +230	
Hythane® 371	Polyether Urethane	TPU-EU	-40 +100	-40 +212	
Hythane® 441	Polyester Urethane	TPU-AU	-30 +110	-22 +230	
Hythane® 591	Polyester Urethane	TPU-AU	-30 +110	-22 +230	
PU 021	Polyester Urethane	TPU-AU	-30 +111	-22 +231	
TPE 051	Polyester	TPE	-40 +120	-40 +250	
TPE 061	Polyester	TPE	-40 +120	-40 +250	
TPE 111	Polyester	TPE	-40 +120	-40 +250	
TPE 201	Polyester	TPE	-30 +100	-22 +212	
TPE 261	Polyester	TPE	-40 +120	-40 +250	
TPE 121	Polyester	TPE	-40 +120	-40 +250	
Armorlene® 702	Engineered Plastic	PTFE	-73 +260	-100 +500	
Armorlene® HLX	Engineered Plastic	PTFE	-73 +288	-100 +550	
TSE 041	Composite	Thermoset Polyester	-40 +120	-40 +250	
TSE 042	Composite	Thermoset Polyester (Reduced Friction)	-40 +120	-40 +250	
POM 0011	Engineered Plastic	POM	-45 +120	-50 +250	
POM 0172	Engineered Plastic	POM w Filler	-45 +120	-50 +250	
PA 041	Engineered Plastic	PA	-40 +120	-40 +250	
PA 533	Engineered Plastic	PA-GF	-40 +120	-40 +250	
PA 707	Engineered Plastic	POM w Filler	-40 +120	-40 +250	
Hallprene C-FKM 0051	Synthetic Rubber	FKM	-20 +200	-4 +392	
Hallprene C-NBR 0251	Composite	Cotton/NBR	-30 +120	-40 +250	
Hallprene C-FKM 0431	Composite	Cotton/FKM	-20 +150	-4 +302	
Nitrile 70°	Synthetic Rubber	NBR	-30 +100	-22 +212	
Nitrile 75°	Synthetic Rubber	NBR	-30 +100	-22 +212	
Nitrile 90°	Synthetic Rubber	NBR	-30 +100	-22 +212	
Nitrile 0041	Synthetic Rubber	NBR	-10 +140	-14 +284	
Nitrile 0141	Synthetic Rubber	NBR	-30 +100	-22 +212	
Nitrile 0211	Synthetic Rubber	NBR	-45 +100	-50 +212	
Nitrile 0271	Synthetic Rubber	NBR	-30 +100	-22 +212	
Nitrile 0471	Synthetic Rubber	NBR	-45 +100	-50 +212	
Nitrile 0801	Synthetic Rubber	NBR	-30 +100	-22 +212	
Nitrile 1411	Synthetic Rubber	NBR	-30 +100	-22 +212	



	HARDNESS	COLOUR	PRODUCTS (STANDARD SHOWN IN BOLD)
	93 IRHD	Blue	80, 601, 605, 606, 607, 609, 610, 616, 620, 616, 620, 621, 622, 652, 653, 657, 658, 659, 660, 661, 663, 667, 668, 673, 755, 770, 800, 834, 839, 839N, 842, 844, 846, 851, 853, 864
	93 IRHD	Black	511, 512, 513
	93 IRHD	Dark Blue	520, 521, 820, 831
	94 IRHD	Dark Blue	860, 862
	96 IRHD	Orange	511, 512, 513, 520, 653, 663, 764, 775 , 820, 842, 844, 864
	55D	Dark Green	820, 842, 847
	93 IRHD	Grey	Special material option
	96 IRHD	Orange	660, 673
	93 IRHD	Dark Blue	657
	72D	Dark Red	754, 755, 770
	55D	Red	38, 754, 755, 770
	55D	Grey	730, 755, 770
	40D	Light Grey	155
	55D	Cream	770, 755
	55D	Orange	511, 512, 513, 520, 521, 770
	62D	Grey	See Hallite's Armorlene® PTFE Catalogue
	66D	Gold	See Hallite's Armorlene® PTFE Catalogue
	NA	Red	506
	NA	Red	506
	R115	Orange	AE Rings 621, 652, 653, 660, 730; Bearings 780
	R120	Red	708
	72D	Brown	Special material option
	R124	Black	533, 714, 720
	R115	Black	Special material option
	75 IRHD	Black	Special material option for standard rubber and rubber/ fabric products (Additional tooling may be required)
	NA	Black	Special material option
	NA	Black	Special material option for standard rubber and rubber/ fabric products (Additional tooling may be required)
	70 IRHD	Black	Standard O-Ring / Square Ring / X-Ring
	75 IRHD	Black	Standard O-Ring / Square Ring / X-Ring
	90 IRHD	Black	Standard O-Ring / Square Ring / X-Ring
	80 IRHD	Black	Special material option
	90 IRHD	Black	Special material option
	70 IRHD	Black	Special material option
	73 IRHD	Black	Special material option
	80 IRHD	Black	Special material option
	75 IRHD	Black	Special material option
	80 IRHD	Black	730, 780

FLUID COMPATIBILITY CHART

Material	Continuous material service temperature range °F	Intermittent material service temperature range °F	Service Fluids								
			Fluids based on mineral oils				Greases		Fuels		
			Motor Oils	Hypoid Gear Oils	Automatic Transmission Fluid	ISO 6743-4 Hydraulic Oils (HL, HM, HV)	Mineral oil based greases	Silicon based greases	Diesel Fuel	Fuel for gasoline/petrol engines - normal	Fuel for gasoline/petrol engines - super
			+302 -40	+302 -40	+320 -58	+212 -22	+212 -22	+482 -58			
Maximum continuous service temperature in fluids °F											
NBR 70 IRHD NBR 90 IRHD Nitrile (medium)	+212 -22	+248 -22	+212	+194	+212	+212	+212	+212	*	*	*
FKM 75 IRHD FKM 90 IRHD Fluoro-elastomer	+390 -4	+482 -4	+302	+302	+320	+212	+212	+390	+302	+302	+302
EPDM 70 IRHD EPDM 80 IRHD	+248 -58	+302 -58	NS	NS	NS	NS	NS	+248	NS	NS	NS
VMQ 70 IRHD Silicone	+390 -67	+482 -67	*	*	*	*	+212	*	NS	NS	NS
HNBR 75 IRHD Hydrogenated Nitrile	+266 -22	+302 -22	+266	+230	+266	+212	+212	+266	*	*	*
AU Polyester PU	+212 -22	+230 -22	+212	+212	+212	+212	+212	+212	+140	+140	+140
EU Polyether PU	+212 -40	+230 -49	+212	+212	+212	+212	+212	+212	+140	+140	+140
Polyester-elastomer	+212 -40	+248 -40	+212	+212	+212	+212	+212	+212	+140	+140	+140
PA Polyamide	+212 -40	+248 -40	+212	+212	+212	+212	+212	+212	+212	+212	+212
POM Acetal	+212 -49	+248 -40	+212	+212	+212	+212	+212	+212	+212	+212	+212
PPS Polyphenylene sulphide	+390 -40	+390 -40	+302	+302	+320	+212	+212	+390	+302	+302	+302
PTFE Polytetra-fluoroethylene	+390 -328	+390 -328	+302	+302	+320	+212	+212	+390	+302	+302	+302
Thermosetting Polyester Resin	+212 -58	+266 -328	+212	+212	+212	+212	+212	+212	+212	+212	+212
PEEK Polyether-etherketone	+482 -85	+572 -85	+302	+302	+320	+212	+212	+482	+302	+302	+302

NOTE

* denotes that values vary greatly for individual elastomers within the group
 NS denotes that the elastomer is not suitable
 This table is credited to the BFPA technical working group 'TC16/WG8'.



Service Fluids											
Fire-resistant hydraulic fluids					Environmentally acceptable fluids				Other service fluids		
ISO 6743-4 HFA-Fluids (5/95 waterbased)	ISO 6734-4 HFB-Fluids (60/40 invert emulsion)	ISO 6743-4 HFC-Fluids (water glycol)	ISO 6743-4 HFDR-Fluids (phosphate ester ALKYL (Aero))	ISO 6743-4 HFDR-Fluids (phosphate ester ARYL (ind.))	ISO 6743-4 HETG-Fluids (vegetable oil based)	ISO 6743-4 HEES-Fluids (synthetic ester based)	ISO 6743-4 HEPG-Fluid (synthetic glycol based)	ISO 6743-4 HEPR-Fluid (synthetic hydrocarbons)	Water in fluid power applications	Air	Brake Fluids
+140 +41	+140 +41	+140 -22	+212 -58	+302 +0	+140 14	+212 -40	+212 -58	+302 -58	+140 +5	+390 +36	+266 -58
Maximum continuous service temperature in fluids °F											
+140	+140	+140	NS	NS	+140	+140	+140	+212	+176	+212	NS
+140	+140	NS	NS	+302	+140	+212	+176	+105	+212	+390	NS
NS	NS	+140	+176	+176	NS	NS	NS	NS	+248	+248	+248
NS	NS	NS	NS	NS	NS	NS	NS	*	+212	+390	+176
+140	+140	+140	NS	NS	+140	+140	+176	+266	+266	+266	NS
+104	+104	NS	NS	NS	+140	+140	+140	+212	+104	+104	NS
+140	+140	+104	NS	NS	+140	+176	+140	+212	+140	+176	NS
+140	+140	NS	NS	NS	+140	+176	+140	+212	+140	+176	NS
+140	+140	+140	+212	+212	+140	+212	+212	+212	+140	+176	+176
+140	+140	+140	+212	+212	+140	+212	+212	+212	+176	+176	+176
+140	+140	+140	+212	+302	+140	+212	+212	+302	+302	+390	+266
+140	+140	+140	+212	+302	+140	+212	+212	+302	+302	+390	+266
+140	+140	+104	+212	+212	+140	+212	+212	+212	+176	+212	NS
+140	+140	+140	+212	+302	+140	+212	+212	+302	+302	+390	+266

NOTE

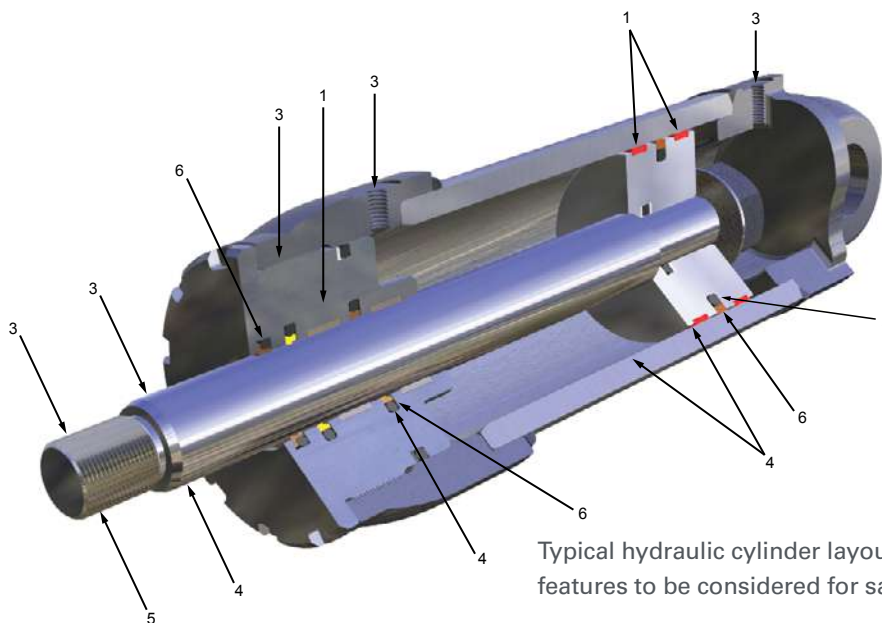
Maximum continuous working temperatures °F and temperature ranges for materials within fluid power fluids. In view of the variations in formulation of both oils and polymers, the compatibility of all combinations should be confirmed by testing and field service performance for each application.



USE & FITTING OF SEALS

Our quality control methods for material and manufacturing processes ensure that all seals leaving our factories are in a condition capable of giving a long and reliable service life. We have found, from many years of experience, that premature seal failure can be avoided if the following recommendations are considered at the design and manufacturing stage of the cylinder:

1. Specify piston and gland bearings which are adequately proportioned to support the cylinder loads. As a result of mounting misalignments and/or the working action of the cylinder, piston and gland bearings will be subjected to sideloading, causing damage to the rod or the tube surface and hence the seal, if the bearings are inadequate.
2. Ensure that seals are stored distortion free in a cool, dry, and dark place prior to fitting. See "Storage of Seals" directions.
3. Check that the seal housing is free from damage likely to harm the seal. Remove all sharp edges and burrs from metal parts, paying particular attention to ports, grooves, and threads over or through which the seal passes during assembly.
4. Clean all seal housing areas, ensuring that all metallic particles and other contaminants have been removed. Check that other surfaces adjacent to the passage of the seal upon fitting are also free of dirt, swarf, or other contaminants. Check that both static and dynamic housing surface finishes meet specifications.
5. Where the difference between a thread diameter over which the seal must pass and the seal diameter is small, use some form of protection over the thread, such as a fitting sleeve made of hard plastic.
6. Check that the seal is of the correct type, part number, and size, and that the specified material is correct. If there is any doubt regarding the material, contact your local Hallite sales office.
7. Lubricate all seals and metal components liberally with clean operating fluid or a compatible grease prior to assembly. N.B. silicone grease should not be used in normal hydraulic applications.
8. Where seals fitted to sub-assemblies, such as pistons, are awaiting further fitting operations, ensure that the seals are not subjected to any misaligned or localized loading which will cause local deformation. Ensure that sub-assemblies remain clean.
9. The use of metal levers is not recommended, but should they be used it is imperative that they are completely smooth and free from nicks and burrs. When using them, ensure that the metal surfaces adjacent to the seal are not damaged.
10. Flush the hydraulic system thoroughly before connecting the cylinder to it.



Typical hydraulic cylinder layout showing installation features to be considered for satisfactory seal life.

CYLINDER OPERATING CONDITIONS

CYLINDER SPECIFICATION		LIGHT-DUTY		MEDIUM-DUTY		HEAVY-DUTY	
PRESSURE	Max	350 bar	5000 psi	500 bar	7500 psi	700 bar	10000 psi
	Normal Working	160 bar No pressure peaks	2300 psi	250 bar Intermittent pressure peaks	3625 psi	400 bar Regular pressure peaks	5800 psi
Design		Lower operating stresses. Rigid well-aligned mounting, minimal side loading.		Steady operating stresses with intermittent high stress, some side loading.		Highly stressed for the majority of its working life. Side loading common.	
Condition of Fluid		Good system filtration. No cylinder contamination likely.		Good system filtration, but some cylinder contamination likely.		Contamination unavoidable from internal and external sources.	
Working Environment		Clean and inside a building. Operating temperature variations limited.		Mixture of indoors and outdoors but some protection from the weather.		Outdoors all the time or dirty indoor area. Wide variations in temperature, both ambient and working. Difficult service conditions.	
Usage		Irregular with short section of stroke at working pressures. Regular usage but at low pressure.		Regular usage with most of the stroke at working pressure.		Large amount of usage at high pressure with peaks throughout the stroke.	
Typical Applications		Machine tools Lifting equipment Mechanical handling Injection moulding machines Control and robot equipment Agricultural machinery Packaging equipment Aircraft equipment Light duty tippers		Heavy duty lifting equipment Agricultural equipment Light duty off-road vehicles Cranes and lifting platforms Heavy duty machine tools Injection moulding machines Some auxiliary mining machinery Aircraft equipment Presses Heavy duty tippers (telescopic) Heavy duty mechanical handling		Foundry and metal fabrication plant Mining machinery Roof supports Heavy duty earthmoving machinery Heavy duty off-road vehicles Heavy duty presses	

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

PRESSURE, SPEED, AND TEMPERATURE RANGE

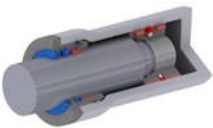
From many years of application experience with sealing hydraulic equipment, supported by the results from an extensive test program, we know that it is necessary to link the three main operating features — speed, pressure, and temperature — to achieve a satisfactory seal performance. After carefully considering each product, we are able to specify the maximum speed and pressure with a temperature range within which the seal will operate safely. If your operating conditions do not comply with those recommended, please send details to your local Hallite sales office.



CYLINDER HOUSING AND SEAL OPTIONS

The following diagrams illustrate how Hallite's wide range of products can be applied to a selection of some of the most popular cylinder designs servicing the world's fluid power industry. Below are cylinders used in standard applications and our recommendations for typical sealing solutions. Please note that cylinder renderings may not accurately reflect the recommendations listed. They are for illustrative purposes only.

If the application which you are interested in is of a non-standard nature please contact Hallite's technical department.

Cylinder Type	Wiper	Rod Seal	Rod Bearing	Buffer
Excavator Cylinder	862 or 820	605 or 621	533	653
				
				
Fork Lift Cylinder	820 or 862	605	533	-
				
				
Grapple Cylinder	862 or 820	621	506	653
				
				

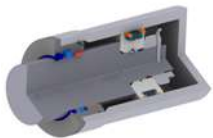
NOTE

Product details for the following products can be found in the Hallite Armorlene® PTFE catalog: 716SPN, R16, CT, E2W, P54.
Product details for the following products can be found in the Hallite Fluid Power Metric catalog: 87, 616, 660, 673, 839N.



Gland Static Seal	Anti-dieseling Ring	Piston Bearing	Piston Seal	Piston Static Seal
O-ring & Back up	87	533	CT or 714	O-ring & 2 Back up
				
O-ring	-	533	755 or 775	O-ring
				
O-ring & Back up	-	533	CT or 720	O-ring & 2 Back up
				

CYLINDER HOUSING AND SEAL OPTIONS

Cylinder Type	Wiper	Rod Seal	Rod Bearing	Buffer
Agriculture Cylinder	520	605	533	-
				
Crane Cylinder	820	716SPN	533	R16 Bronze
				
High Temperature Cylinder	E2W	R16 Bronze	87	R16 Bronze
				
Injection Molding Machine Cylinder	820	605 or 616	87	R16 Glass
				
Backhoe Cylinder	820 or 839N	605 or 673	533	653
	 	 		

NOTE

Product details for the following products can be found in the Hallite Armorlene® PTFE catalog: 716SPN, R16, CT, E2W, P54. Product details for the following products can be found in the Hallite Fluid Power Metric catalog: 87, 616, 660, 673, 839N.



Gland Static Seal	Anti-dieseling Ring	Piston Bearing	Piston Seal	Piston Static Seal
O-ring & Back up	-	533	770	O-ring & 2 Back up
				
O-ring & Back up	-	533	755	O-ring & 2 Back up
				
O-ring	-	87	P54 Bronze	O-ring
				
O-ring	-	87	P54 Glass	O-ring
				
O-ring & Back up	-	533	755 or 714	O-ring & 2 Back up
				

SPECIFIED TOLERANCE TABLES

CYLINDER HOUSING AND ROD, PISTON, BORE, AND GLAND TOLERANCES

NOMINAL SIZES mm		SHAFTS (OUTSIDE DIAMETER) UNITS 0.001 mm								BORE (INSIDE DIAMETER) UNITS 0.001 mm				
over	to	f8	f9	h8	h9	h10	h11	js10	js11	H8	H9	H10	H11	Js11
1.6	3	-6 -4	-6 -31	0 -14	0 -25	0 -40	0 -60	+20 -4	+30 -22	+14 0	+25 0	+40 0	+60 0	+30 -22
3	6	14 -28	14 -40	0 -18	0 -22	0 -48	0 -75	+24 -24	+37.5 -37.5	+18 0	+30 0	+48 0	+75 0	+37.5 -37.5
6	10	-13 -35	-13 -49	0 -22	0 -36	0 -58	0 -90	+29 -29	+45 -49	+22 0	+36 0	+58 0	+90 0	+45 -49
10	18	-16 -43	-16 -59	0 -27	0 -43	0 -70	0 -110	+35 -35	+55 -67	+27 0	+43 0	+70 0	+110 0	+55 -67
18	30	-4 -53	-4 -72	0 -33	0 -52	0 -84	0 -130	+42 -42	+65 -85	+33 0	+52 0	+84 0	+130 0	+65 -85
30	50	-25 -64	-25 -87	0 -39	0 -62	0 140	0 -160	+50 -58	+80 -80	+39 0	+62 0	+100 0	+160 0	+80 -80
50	80	-22 -76	-22 144	0 -46	0 -74	0 -120	0 -190	+60 -60	+95 -95	+46 0	+74 0	+120 0	+190 0	+95 -95
80	120	-36 -90	-36 -123	0 -54	0 -87	0 -140	0 -220	+70 -70	+110 -110	+54 0	+87 0	+140 0	+220 0	+110 -110
120	180	-43 146	-43 -143	0 -63	0 140	0 -160	0 -250	+80 -80	+125 -125	+63 0	+100 0	+160 0	+250 0	+125 -125
180	250	-58 -122	-58 -165	0 -72	0 -115	0 -185	0 -290	+92 -92	+145 -145	+72 0	+115 0	+185 0	+290 0	+145 -145
250	315	-56 -137	-56 -186	0 -81	0 -130	0 -210	0 -320	+105 145	+160 -160	+81 0	+130 0	+210 0	+320 0	+160 -160
315	400	-62 -151	-62 -42	0 -89	0 -140	0 -230	0 -360	+115 -115	+180 -180	+89 0	+140 0	+230 0	+360 0	+180 -180
400	500	-68 -165	-68 -223	0 -97	0 -155	0 -250	0 -400	+125 -125	+200 -40	+97 0	+155 0	+250 0	+400 0	+200 -40
500	630	-76 -186	-76 -251	0 -110	0 -175	0 -280	0 -440	+140 -140	+220 -220	+110 0	+175 0	+280 0	+440 0	+220 -220
630	800	-80 -45	-80 -280	0 -125	0 -40	0 -320	0 -580	+160 -160	+250 -250	+125 0	+200 0	+320 0	+500 0	+250 -250

NOMINAL SIZES in		SHAFTS (OUTSIDE DIAMETER) UNITS 0.001 in								BORE (INSIDE DIAMETER) UNITS 0.001 in				
over	to	f8	f9	h8	h9	h10	h11	js10	js11	H8	H9	H10	H11	Js11
0.04	0.12	-0.3 -0.9	-0.3 -1.2	0 -0.6	0 -1.0	0 -1.6	0 -2.5	+0.8 -0.8	+1.3 -1.3	+0.6 0	+1.0 0	+1.6 0	+2.5 0	+1.3 -1.3
0.12	0.24	-0.4 -1.1	-0.4 -1.6	0 -0.7	0 -1.2	0 -1.8	0 -3.0	+0.9 -0.9	+1.5 -1.5	+0.7 0	+1.2 0	+1.8 0	+3.0 0	+1.5 -1.5
0.24	0.40	-0.5 -1.4	-0.5 -1.9	0 -0.9	0 -1.4	0 -2.2	0 -3.5	+1.1 -1.1	+1.8 -1.8	+0.9 0	+1.4 0	+2.2 0	+3.5 0	+1.8 -1.8
0.40	0.71	-0.6 -1.6	-0.6 -2.3	0 -1.0	0 -1.6	0 -2.8	0 -4.0	+1.4 -1.4	+2.0 -2.0	+1.0 0	+1.6 0	+2.8 0	+4.0 0	+2.0 -2.0
0.71	1.19	-0.8 -2.0	-0.8 -2.8	0 -1.2	0 -2.0	0 -3.5	0 -5.0	+1.8 -1.8	+2.5 -2.5	+1.2 0	+2.0 0	+3.5 0	+5.0 0	+2.5 -2.5
1.19	1.97	-1.0 -2.6	-1.0 -3.4	0 -1.6	0 -2.5	0 -4.0	0 -6.0	+2.0 -2.0	+3.0 -3.0	+1.6 0	+2.5 0	+4.0 0	+6.0 0	+3.0 -3.0
1.97	3.15	-1.2 -3.0	-1.2 -4.1	0 -1.8	0 -3.0	0 -4.5	0 -7.0	+2.3 -2.3	+3.5 -3.5	+1.8 0	+3.0 0	+4.5 0	+7.0 0	+3.5 -3.5
3.15	4.73	-1.4 -3.6	-1.4 -4.8	0 -2.2	0 -3.5	0 -5.0	0 -9.0	+2.5 -2.5	+4.5 -4.5	+2.2 0	+3.5 0	+5.0 0	+9.0 0	+4.5 -4.5
4.73	7.09	-1.6 -4.1	-1.6 -5.6	0 -2.5	0 -4.0	0 -6.0	0 14.0	+3.0 -3.0	+5.0 -5.0	+2.5 0	+4.0 0	+6.0 0	+10.0 0	+5.0 -5.0
7.09	9.85	-2.0 -4.8	-2.0 -6.5	0 -2.8	0 -4.5	0 -7.0	0 -12.0	+3.5 -3.5	+6.0 -6.0	+2.8 0	+4.5 0	+7.0 0	+12.0 0	+6.0 -6.0
9.85	12.41	-2.2 -5.2	-2.2 -7.3	0 -3.0	0 -5.0	0 -8.0	0 -12.0	+4.0 -4.0	+6.0 -6.0	+3.0 0	+5.0 0	+8.0 0	+13.0 0	+6.0 -6.0
12.41	15.75	-2.5 -6.0	-2.8 -8.0	0 -3.5	0 -6.0	0 -9.0	0 -14.0	+4.5 -4.5	+7.0 -7.0	+3.5 0	+6.0 0	+9.0 0	+14.0 0	+7.0 -7.0
15.75	19.69	-2.8 -6.5	-2.8 -8.8	0 -4.0	0 -6.0	0 14.0	0 -16.0	+5.0 -5.0	+8.0 -8.0	+4.0 0	+6.0 0	+10.0 0	+16.0 0	+8.0 -8.0
19.69	24.80	-3.0 -7.0	-3.0 -9.9	0 -4.3	0 -6.9	0 -11.0	0 -17.3	+5.5 -5.5	+8.7 -8.7	+4.3 0	+6.9 0	+11.0 0	+17.3 0	+8.7 -8.7
24.80	31.49	-3.1 -8.1	-3.1 -11.0	0 -4.9	0 -7.9	0 -12.6	0 -19.7	+6.3 -6.3	+9.8 -9.8	+4.9 0	+7.9 0	+12.6 0	+19.7 0	+9.8 -9.8



BEARING MATERIALS AND DIMENSIONAL TOLERANCES

HALLITE 87, 506, 533, & 708 BEARING STRIP

Hallite 87 strip is a low-friction bronze-filled PTFE compound produced in a flat tape style ready to be cut to size to suit individual applications. It is particularly effective in friction-conscious applications, such as servo cylinders.

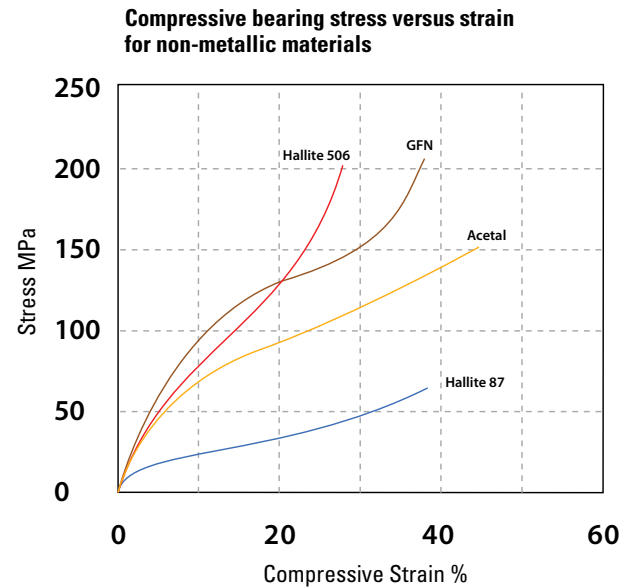
Hallite 506 can be supplied in spiral lengths, generally in 10 metre lengths, as individual cut bearings, and also in 10 metre lengths, packed flat in a box dispenser. Hallite 506 bearing strip is manufactured to extremely accurate thickness tolerances, ensuring reliable cylinder alignment. Other sizes of Hallite 506 are available on request; special sections and diameters can also be produced to suit individual requirements.

Hallite 533 bearings are formed glass-filled nylon rings made for many different housing sizes.

Hallite 708 bearings are manufactured from POM 0172, an advanced proprietary material for exceptional load bearing and wear resistant capabilities.

BEARING STRIP HOUSING TOLERANCES

Please refer to the detailed bearing information located in the bearing section of this catalogue or on our website.



BEARING TYPE	STANDARD MATERIAL
87	PTFE + Bronze
506	Polyester + PTFE
533	GFN
708	POM 0172

SPECIFIED TOLERANCES	METRIC		INCH	
	BEARING LENGTH	BEARING CROSS SECTION	BEARING LENGTH	BEARING CROSS SECTION
	L ₁	S	L ₁	S
Hallite 87	-0.10 to -0.50	+0.03 to -0.05	-	-
Hallite 708	-0.10 to -0.60	-0.02 to -0.10	-	-
Hallite 506	-0.10 to -0.60	-0.02 to -0.08	-0.005 to -0.025	-0.001 to -0.003
Hallite 533	-	-	-0.000 to -0.010	-0.001 to -0.004



HOUSING DESIGNS AND EXTRUSION GAPS

HALLITE 87, 506, 533 & 708 BEARING STRIP

Hallite's product data sheets give information indicating the allowable extrusion gap a seal can see at pressure during its working life. The extrusion gap can be calculated using the tolerance build-ups within the cylinder and any dilation that may occur under pressure.

- Maximum extrusion gap = F max (see drawing below).
- F max is the maximum extrusion gap for the seal.
- Minimum metal-to-metal clearance = F min (see drawing below).

F min for cylinders with minimal side loading should be >0.01mm (0.004 in).

RODS

Maximum extrusion gap

$$F \max = \frac{(\varnothing D_3 \max + \varnothing D_2 \max)}{2} - S \min - \varnothing d_1 \min$$

Minimum metal-to-metal clearance (extrusion gap)

$$F \min = S \min - \frac{(\varnothing D_2 \max - \varnothing D_3 \min)}{2}$$

PISTONS

Maximum extrusion gap

$$F \max = \varnothing D_1 \max - S \min - \frac{(\varnothing d_3 \min + \varnothing d_2 \min)}{2} + \text{dilation}$$

Minimum metal-to-metal clearance (extrusion gap)

$$F \min = S \min - \frac{(\varnothing d_3 \max - \varnothing d_2 \min)}{2}$$

Calculate both F max and F min

Ensure the F min is greater than 0.1mm (0.004 in) and F max is less than the maximum extrusion gap stated on the seal data sheet at the application's working pressure.

For built-in metal bearings, the extrusion gap calculation is simpler.

For F max:

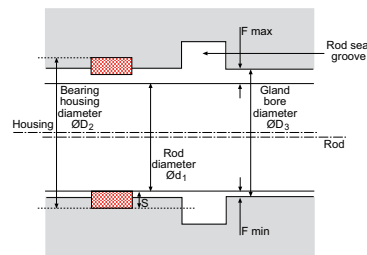
$$\text{Rod} = \varnothing D_3 \max - \varnothing d_1 \min$$

$$\text{Piston} = \varnothing D_1 \max - \varnothing d_3 \min + \text{dilation}$$

F min must be zero.

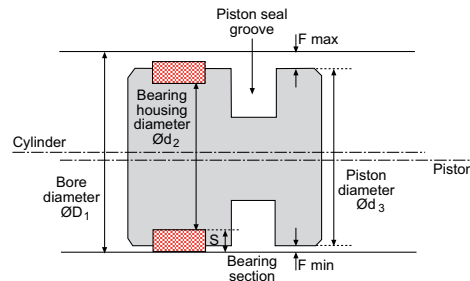
ROD BEARING

Note: Rod is not concentric with gland, because of clearances. (shown exaggerated)



PISTON BEARING

Note: Piston is not concentric with cylinder bore, because of clearances. (shown exaggerated)

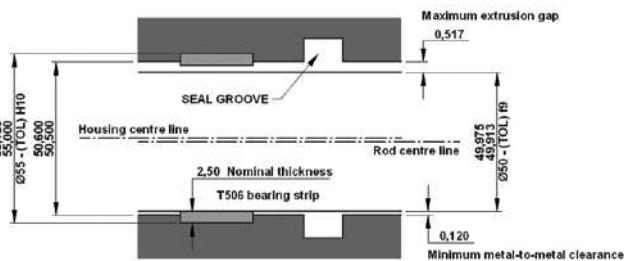


HOUSING DESIGNS

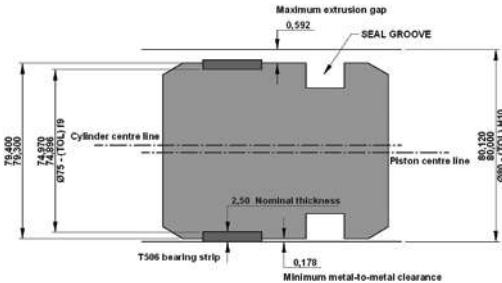
EXTRUSION GAPS AND METAL-TO-METAL CLEARANCE

The use of remote bearing strips, such as Hallite 506, often creates a conflict between maximizing the metal-to-metal clearance, avoiding metal-to-metal contact, and minimizing the extrusion gap for the seal. The design decisions that have to be made in this respect are not trivial. The following examples show the effects of looser and tighter tolerances on the minimum metal-to-metal clearance and the maximum extrusion gap. The values have been calculated using the housing design formula. No allowance has been made for the deflection of the bearings under side load or for the cylinder dilation, in the case of the piston example.

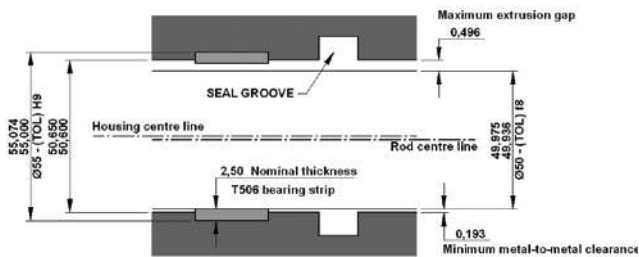
Gland for 50mm rod using 'standard' tolerances.



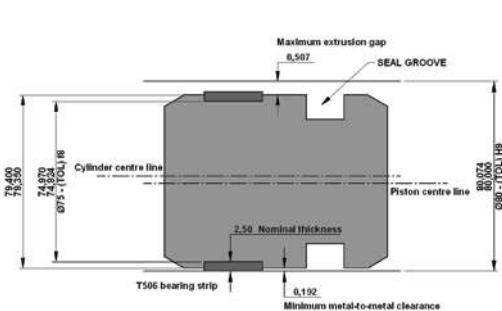
Piston for 80mm bore using 'standard' tolerances.



Gland for 50mm rod with tighter tolerances, showing that the minimum metal-to-metal clearance can be increased and the maximum extrusion gap reduced.



Piston for 80mm bore with tighter tolerances showing that minimum metal-to-metal clearance can be increased and maximum extrusion gap reduced.



Once the maximum extrusion gap has been calculated, the correct seal can be specified with regard to the required operating pressure of the cylinder. For further advice, please contact your local Hallite technical team.

STORAGE OF SEALS

STORAGE CONDITIONS

Most polymeric items, including vulcanized rubber and other elastomers, tend to change their properties during storage and may become unserviceable. This may be due to hardening, softening, cracking, crazing, or other degradation and may be the result of oxygen, ozone, light, heat, and/or humidity. The following recommendations indicate the most suitable conditions for storing elastomeric items, whether as a single item or composite product.

1. **Temperature** - Storage temperatures should not exceed 50°C (122°F). Low temperatures are not permanently harmful, provided the rubber items are handled carefully and not distorted. When taken from low temperatures, items should be raised to approximately 30°C (86°F) before they are used.
2. **Humidity** - Optimum humidity is about 65% in a draft-free atmosphere.
3. **Light** - Protection from direct sunlight and strong artificial light with a high ultraviolet content is important. Unless packed in opaque containers, it is advisable to cover windows with red or orange screens or coatings.
4. **Oxygen and Ozone** - Wrapping, storage in airtight containers, or other suitable means should be used for vulcanized rubber items. Storage in containers that limit exposure to environmental conditions (e.g. sealed plastic bags) should be used for all materials when possible.
5. **Deformation** - Where possible, rubber items should be stored in a relaxed position, free from tension or compression. Laying the item flat and avoiding suspension or crushing keeps it free from strain and minimises deformation.
6. **Contact with Liquid and Semi-Solid Material** - Contact with liquids and semi-solid materials, particularly solvents, such as oils or greases should be avoided unless so packed by the manufacturer.
7. **Contact with Metals** - Metals such as manganese, iron, copper, or copper alloys can have a harmful effect on rubber. A layer of paper, polyethylene, or cellophane will keep these separated.
8. **Contact with Non-Metals** - Contact with other rubbers or creosotes should be avoided.
9. **Stock Rotation** - Elastomers should be stored for as short a period as possible, and strict stock rotation should be practiced.
10. **Cleaning** - Organic solvents such as trichloroethylene, carbon tetrachloride, and petroleum are the most harmful agents. Soap, water, and methylated spirits are the least harmful, and all parts should be dried at room temperature before use.
11. **Shelf Life** - The table below shows the storage life of seal components made from the more common materials under ideal conditions. Storing under less-than-ideal conditions will reduce the life of the component.

Careful inspection for the following should be made before installation and after storage:

- Mechanical damage
- Cracks or surface crazing
- Permanent distortion
- Tackiness or surface softening/hardening

Thin components (less than 1.6mm {1/16in}) tend to be more critically affected.

The appearance of bloom is relatively unimportant, except in certain non-toxic applications.

BASE POLYMER (ISO DESIGNATION)	PRIMARY STORAGE PERIOD (YEARS)	EXTENSION OF STORAGE PERIOD AFTER RE-INSPECTION (YEARS)
FLUOROCARBON (FKM) ETHYLENE PROPYLENE (EPDM)	10	5
NITRILE (NBR) TPU-EU	7	3
TPU-AU	5	2
ENGINEERING THERMOPLASTICS: ACETAL (POM) / POLYAMIDE (PA) / GLASS-FILLED NYLON (PA) / PTFE POLYPHENYLENE SULPHIDE (PPS)	UNLIMITED	-
ENGINEERING THERMOSETS: T506 BEARING STRIP	UNLIMITED	-



SURFACE FINISH

The dynamic surface finish has an immense influence on operation and service life of a sealing component. If the surface is too smooth, it will not properly retain lubrication and will cause excessive seal wear due to frictional heat. If the surface is too coarse, premature seal failure may occur due to the roughness of the surface, hence causing small cuts or scores in the sealing lip. Proper surface finish is critical in assuring maximum seal performance and life within a given application.

The static sealing and housing surface also has a significant influence on the operation and service life of a seal. Though the surface finish requirements are not as severe, it is critical to ensure surface finish recommendations are met to maximise seal performance and life.

DYNAMIC SURFACE FINISHES

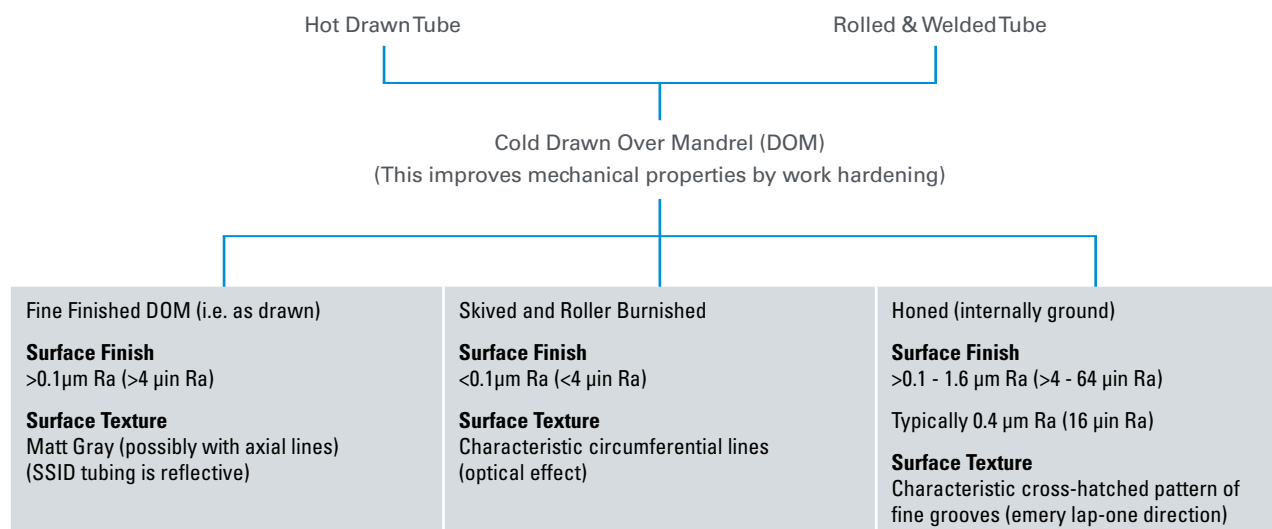
Piston rods are generally hard chrome plated. The hardness target should be at least 67 Rockwell C (900 HV/10). This gives an excellent tribological surface, and provided the rods are produced by an established supplier within a surface finish range of 0.1 to 0.3 $\mu\text{m Ra}$ (4-12 $\mu\text{in Ra}$), no major problem should ensue. The optimum surface finish may also depend on the seal material. Bore surface finishes can be more problematic. The typical methods of achieving bore finishes are summarized in the figure below and bulleted details:

- Drawn Over Mandrel (DOM) tubing as produced, can be either adequate or inadequate depending on the actual surface texture achieved and the application.
- Special Smooth Inside Diameter (SSID) DOM: With the advent of improved manufacturing processes, SSID tubing is more commonplace than it was years ago. In certain circumstances however, SSID finishes, just like its rougher finish relative DOM tube, can lead to premature wear of the seal through flow erosion. Careful specification and regular quality inspections are recommended if SSID tube is to be used.
- Optimally, Skived & Roller Burnished or Honed Tube is preferred.
 - Skived & Roller Burnished tubing is very smooth (less than 0.1 $\mu\text{m Ra}$) (4 $\mu\text{in Ra}$). Rubber sealing elements are more susceptible to damage due to the smoother surfaces.
 - Honed Tube (produced between 0.1 and 0.4 $\mu\text{m Ra}$) (4-16 $\mu\text{in Ra}$) is potentially the most expensive, but has the best finish and is known to be the friendliest to mating sealing elements.

STATIC SURFACE FINISHES

The static sealing surface finish must not be ignored in the control of leakage. Generally, these are fine turned and should be free from chatter marks.

METHODS OF MANUFACTURING OF TUBES FOR HYDRAULIC CYLINDERS AND RESULTING SURFACE TEXTURES

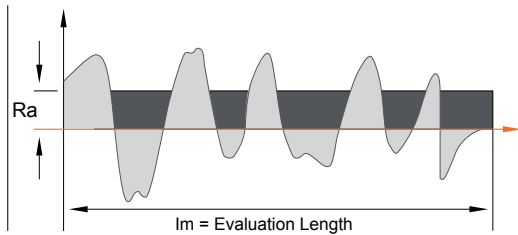


SURFACE FINISH

CRITICAL SURFACE FINISH MEASUREMENTS FOR SEALING

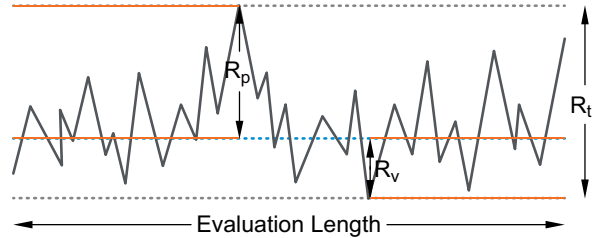
Many parameters can be used to define surface finishes, which are explained in ISO 4287 and ISO 4288. The most commonly used in the fluid power industry include:

Ra – Surface Finish Measurement



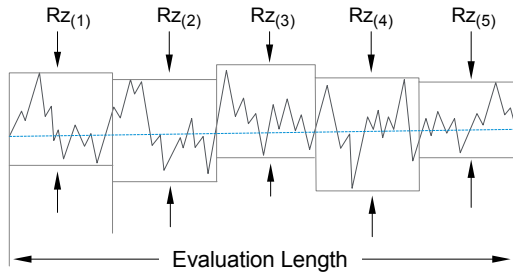
Ra = Arithmetical mean deviation of an absolute ordinate over the evaluation length

Rt – Surface Finish Measurement



Rt = Sum of height of the largest profile peak height R_p and the largest profile valley R_v over the evaluation length

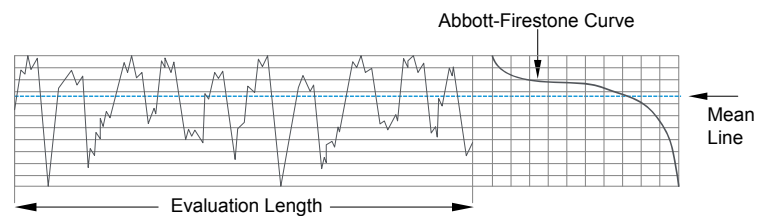
Rz – Surface Finish Measurement



$$Rz = (Rz(1) + Rz(2) + Rz(3) + Rz(4) + Rz(5))/5$$

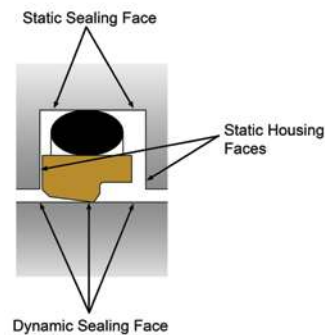
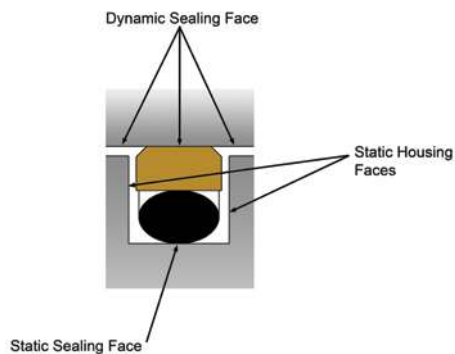
$Rz(n)$ = Sum of height of the largest profile peak height R_p and the largest profile valley R_v within a sampling length

Rmr – Surface Finish Measurement



The 'sharpness' of the surface using a material ratio taken from the Abbott-Firestone curve. The material ratio at a particular height is a slice through the profile giving the percentage length of the cut at that height compared to the evaluation length. The Rmr values are at a depth of 25% of the Rz value from a reference level of 5%.

SEALING FACE PROFILES



SURFACE FINISH

SURFACE FINISH RECOMMENDATIONS - PTFE MATERIALS

SURFACE ROUGHNESS	METRIC			INCH			Rmr*
	µmRa	µmRz	µmRt	µinRa	µinRz	µinRt	
Dynamic Sealing Face Ød₁	0.05 - 0.2	1.6 max	2 max	2 - 8	63 max	157 max	50-80%
Static Sealing Face ØD₁	1.6 max	6.3 max	10 max	63 max	250 max	394 max	
Static Housing Faces L₁	3.2 max	10 max	16 max	125 max	394 max	630 max	

*Rmr is measured at a depth of 25% of the Rz value based upon a reference level (zero line) at 5% material/bearing area.

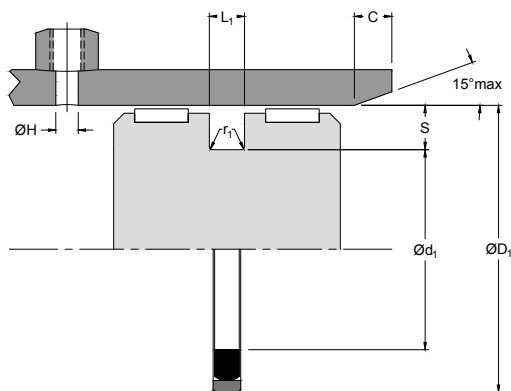
SURFACE FINISH RECOMMENDATIONS - TPU, TPE, & RUBBER MATERIALS

SURFACE ROUGHNESS	METRIC			INCH			Rmr*
	µmRa	µmRz	µmRt	µinRa	µinRz	µinRt	
Dynamic Sealing Face Ød₁	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max	50-80%
Static Sealing Face ØD₁	1.6 max	6.3 max	10 max	63 max	250 max	394 max	
Static Housing Faces L₁	3.2 max	10 max	16 max	125 max	394 max	630 max	

*Rmr is measured at a depth of 25% of the Rz value based upon a reference level (zero line) at 5% material/bearing area.



DOUBLE-ACTING PISTON SEALS



714

PISTON SEAL

*Double-Acting
Glass-Filled Nylon Face with Rubber Energizer
for Heavy Duty Applications*

DESIGN

The Hallite 714 double-acting piston seal is a compact seal for medium to heavy-duty applications.

In double-acting telescopic cylinders or phasing cylinders, the seal's reinforced, heat-stabilized, thermoplastic sealing face with step-cut joint is an ideal choice because it allows the seal to pass over ports without damage. The rugged, extrusion resistant design also performs extremely well in high-pressure off-highway and earthmoving applications where the seal face can tolerate the large extrusion gaps which are required to prevent piston-to-bore contact.

The abrasion resistant glass-filled nylon (GFN) face seal material allows the seal to work well on super smooth inside diameter (SSID) as drawn tube. The precision molded face has chamfers which coupled with a profiled NBR expander allows for easier cylinder assembly.

The expander material comes in a number of material options to extend operating conditions. Contact your local Hallite technical team to decide which is best for your application.



FEATURES

- Passes over ports
- High pressure capability
- Static load holding capability
- Excellent wear and abrasion resistance well proven for use on SSID tube
- Replaces multiple piston rings in double-acting telescopic cylinders
- Chamfered cap with profiled expander for easier cylinder assembly
- Excellent dynamic and static sealing performance

MATERIALS

As standard, this product comes in the following materials. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Face Type	Face Color
Standard	PA 533-NBR	PA-GF	Black



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-40°C +110°C	-40°F +230°F
Maximum Pressure	500 bar	7500 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

MAXIMUM EXTRUSION GAP				
Pressure bar	500			
Groove Section S mm	5.5	7.75	10.5	12.25
Maximum Gap mm	0.35	0.50	0.60	0.80
Pressure psi	7250			
Groove Section S in	0.269	0.296	0.38	0.438
Maximum Gap in	0.014	0.020	0.024	0.032

NOTE

Figures show the maximum permissible gap all on one side using minimum rod $\varnothing$ and maximum clearance $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing D_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing d_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

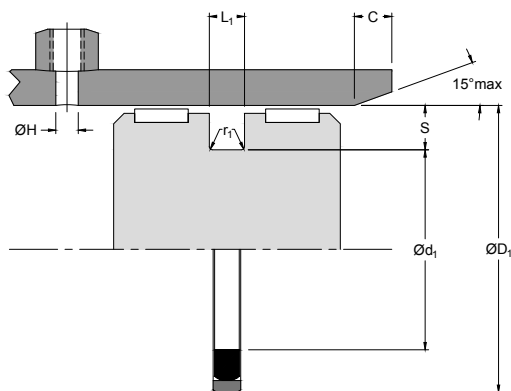
CHAMFERS & RADII								
Groove Section S	5.50	7.75	10.50	12.25	0.269	0.296	0.380	0.438
Min Chamfer C	4.00	6.00	8.00	10.00	0.250	0.250	0.375	0.375
Max Fillet Rad r ₁	0.40	0.80	0.80	0.80	0.016	0.032	0.032	0.032

PORT DIAMETER		
Max $\varnothing H$	$L_1 \text{ mm} \times 0.85$	$L_1 \text{ in} \times 0.850$

NOTE

If the seal is to pass over the port, step-cut joint position must be taken into account.

TOLERANCES	$\varnothing D_1$	$\varnothing d_1$	L_1
mm	H9	h9	+0.20 -0
in	H9	h9	+0.008 -0



714

PISTON SEAL

*Double-Acting
Glass-Filled Nylon Face with Rubber Energizer
for Heavy Duty Applications*

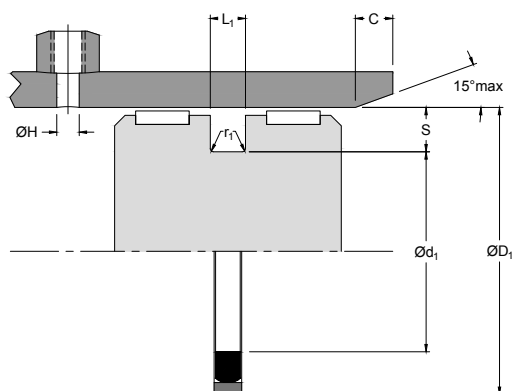
PART NUMBER RANGE

INCH					
ØD ₁	TOL H9	Ød ₁	TOL h9	L ₁ +0.008 -0	PART No.
1.750	+0.003 0.000	1.212	0.000 -0.003	0.282	7267610
2.000	+0.003 0.000	1.462	0.000 -0.003	0.282	7268210
2.250	+0.003 0.000	1.712	0.000 -0.003	0.282	7267710
2.500	+0.003 0.000	1.908	0.000 -0.003	0.312	7261710
2.500	+0.003 0.000	1.962	0.000 -0.003	0.282	7260810
2.750	+0.003 0.000	2.212	0.000 -0.003	0.282	7267810
3.000	+0.003 0.000	2.408	0.000 -0.003	0.312	7261810
3.000	+0.003 0.000	2.442	0.000 -0.003	0.282	7260910
3.250	+0.004 0.000	2.692	0.000 -0.003	0.282	7262910
3.500	+0.004 0.000	2.908	0.000 -0.003	0.312	7261910
3.500	+0.004 0.000	2.942	0.000 -0.003	0.282	7261110
3.750	+0.004 0.000	3.192	0.000 -0.004	0.282	7263110
4.000	+0.004 0.000	3.408	0.000 -0.004	0.312	7262110
4.000	+0.004 0.000	3.442	0.000 -0.004	0.282	7261210
4.250	+0.004 0.000	3.692	0.000 -0.004	0.282	7263210

NOTE

These part numbers supercede legacy 714 part numbers for the same size grooves given in earlier catalogs and data sheets. For more information on the legacy part numbers please contact your local Hallite sales representative.



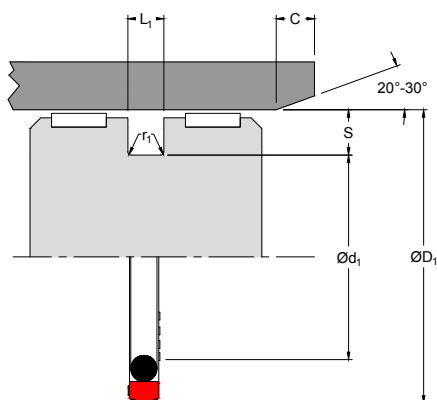


PART NUMBER RANGE

INCH					
ØD ₁	TOL H9	Ød ₁	TOL h9	L ₁ +0.008 -0	PART No.
4.500	+0.004 0.000	3.908	0.000 -0.004	0.312	7262210
4.500	+0.004 0.000	3.942	0.000 -0.004	0.282	7261310
4.750	+0.004 0.000	4.192	0.000 -0.004	0.282	7267910
5.000	+0.004 0.000	4.240	0.000 -0.004	0.375	7262310
5.000	+0.004 0.000	4.442	0.000 -0.004	0.282	7268310
5.250	+0.004 0.000	4.490	0.000 -0.004	0.375	7268410
5.500	+0.004 0.000	4.740	0.000 -0.004	0.375	7261410
6.000	+0.004 0.000	5.240	0.000 -0.004	0.375	7261610
6.500	+0.004 0.000	5.740	0.000 -0.004	0.375	7262410
7.000	+0.004 0.000	6.240	0.000 -0.004	0.375	7262610
7.500	+0.004 0.000	6.740	0.000 -0.004	0.375	7262710
8.000	+0.004 0.000	7.240	0.000 -0.004	0.375	7262810
9.000	+0.004 0.000	8.124	0.000 -0.004	0.375	7268010
10.000	+0.005 0.000	9.124	0.000 -0.004	0.375	7268110

NOTE

These part numbers supercede legacy 714 part numbers for the same size grooves given in earlier catalogs and data sheets. For more information on the legacy part numbers please contact your local Hallite sales representative.



754

PISTON SEAL

*Double-Acting
Polyester Face with Pre-Loaded O-Ring*

DESIGN

The Hallite 754 double-acting piston seal is a compact, low friction seal for light to medium duty applications.

The Hallite 754 is comprised of a tough, wear-resistant thermoplastic elastomer face seal which is pre-loaded by a NBR O-ring. The face material comes in a number of material options to extend operating conditions. The housing width allows a narrow width piston to be used.

We recommend that an adequate bearing, such as the Hallite 506 or 87 bearing strip, is mounted on one or both sides of the seal. For further details of bearing grooves, please refer to the appropriate product data sheet.



FEATURES

- Excellent position holding characteristics under load
- Low breakout and low operating friction levels
- Excellent wear resistance
- More tolerant to contamination
- Rapid recovery of face after assembly
- Compatible with most hydraulic fluids
- Operates on wide range of surface finishes
- Ideal for use with Hallite 506 or 87 bearing

MATERIALS

This product comes in a number of material options to extend operating conditions. Contact your local Hallite technical team to decide which is best for your application. Use the part designator in the table below as the last digit of the part number to specify material choice when ordering. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Face Type	Face Color	Part Designator
Standard	TPE 061 - NBR	TPE	Red	0
Optional	TPE 051 - NBR	TPE	Dark Red	3



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-40°C +110°C	-40°F +230°F
Maximum Pressure for TPE 061 Face	350 bar	5000 psi
Maximum Pressure for TPE 051 Face	500 bar	7500 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

MAXIMUM EXTRUSION GAP				
TPE 061 FACE				
Pressure bar	100	160	250	350
Maximum Gap (S>7 mm)	1.00	0.80	0.60	0.40
Maximum Gap (S<7 mm)	0.80	0.60	0.50	0.30
Pressure psi	1500	2400	3750	5000
Maximum Gap (S>0.25 in)	0.040	0.032	0.024	0.016
Maximum Gap (S<0.25 in)	0.032	0.024	0.020	0.012

TPE 051 FACE				
Pressure bar	160	250	400	500
Maximum Gap (S>7 mm)	1.00	0.80	0.60	0.40
Maximum Gap (S<7 mm)	0.80	0.60	0.40	0.20
Pressure psi	2400	3750	6000	7500
Maximum Gap (S>0.25 in)	0.040	0.032	0.024	0.016
Maximum Gap (S<0.25 in)	0.032	0.024	0.016	0.008

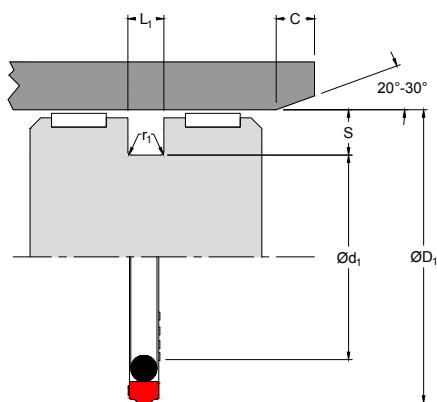
NOTE

Figures show the maximum permissible gap all on one side using minimum rod $\varnothing$ and maximum clearance $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing D_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing d_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII				
Groove Section $\leq S$ mm	3.75	5.50	7.75	10.50
Min Chamfer C mm	2.00	2.50	5.00	5.00
Max Fillet Rad r_1 mm	0.40	0.80	1.20	1.60
Groove Section $\leq S$ in	0.150	0.220	0.310	0.410
Min Chamfer C in	0.080	0.100	0.200	0.200
Max Fillet Rad r_1 in	0.016	0.032	0.047	0.063

TOLERANCES	$\varnothing D_1$	$\varnothing d_1$	L_1
mm	H9	h9	+0.20 -0
in	H9	h9	+0.008-0



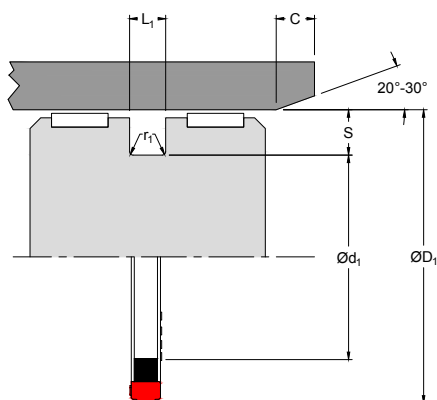
754

PISTON SEAL

*Double-Acting
Polyester Face with Pre-Loaded O-Ring*

PART NUMBER RANGE

INCH					
ØD ₁	TOL H9	Ød ₁	TOL h9	L ₁ +0.008-0	PART No.
1.250	+0.003 0.000	0.974	0.000 -0.002	0.126	4339810
1.375	+0.003 0.000	1.079	0.000 -0.002	0.126	4352410
1.500	+0.003 0.000	1.067	0.000 -0.002	0.165	4432310
1.500	+0.003 0.000	1.204	0.000 -0.003	0.125	4428710
2.000	+0.003 0.000	1.567	0.000 -0.003	0.165	4327110
2.500	+0.003 0.000	2.067	0.000 -0.003	0.165	4326910
2.750	+0.003 0.000	2.140	0.000 -0.003	0.248	4763410
2.750	+0.003 0.000	2.318	0.000 -0.003	0.165	4326810
3.250	+0.004 0.000	2.640	0.000 -0.003	0.248	4428810
4.000	+0.004 0.000	3.390	0.000 -0.004	0.248	4428910
5.000	+0.004 0.000	4.390	0.000 -0.004	0.248	4429010



755

PISTON SEAL

*Double-Acting
Polyester Face with Rubber Energizer*

DESIGN

The Hallite 755 double-acting piston seal is a compact, low friction seal for light to medium duty applications designed originally to fit North American NFPA groove standards.

The Hallite 755 is comprised of a tough, wear-resistant thermoplastic elastomer face seal which is pre-loaded by a square cross-section NBR expander. The face material comes in a number of material options to extend operating conditions. The housing width allows a narrow width piston to be used.

We recommend that an adequate bearing, such as the Hallite 506 or 87 bearing strip or the Hallite 533 molded bearing, is mounted on one or both sides of the seal. For further details of bearing grooves, please refer to the appropriate product data sheet.



FEATURES

- Excellent position holding characteristics under load
- Low breakout and low operating friction levels
- Excellent wear resistance
- More tolerant to contamination
- Rapid recovery of face after assembly
- Compatible with most hydraulic fluids
- Operates on wide range of surface finishes
- Ideal for use with Hallite 506, 533, or 87 bearing

MATERIALS

This product comes in a number of material options to extend operating conditions. Contact your local Hallite technical team to decide which is best for your application. Use the part designator in the table below as the last digit of the part number to specify material choice when ordering. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Face Type	Face Color	Part Designator
Standard	TPE 061 - NBR	TPE	Red	0
Optional	TPE 111 - NBR	TPE	Grey	1
Optional	TPE 261 - NBR	TPE	Cream	2
Optional	TPE 051 - NBR	TPE	Dark Red	3
Optional - Limited Size Range	Hythane® 181 - NBR	TPU-EU	Blue	4



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-40°C +110°C	-40°F +230°F
Maximum Pressure	350 bar	5000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

NOTE

Technical details shown are for the standard material TPE 061.

MAXIMUM EXTRUSION GAP				
Pressure bar	100	160	250	350
Pressure psi	1500	2400	3750	5000
Maximum Gap (S>0.280 in)	0.030	0.025	0.020	0.010
Maximum Gap (S<0.280 in)	0.025	0.020	0.015	0.005

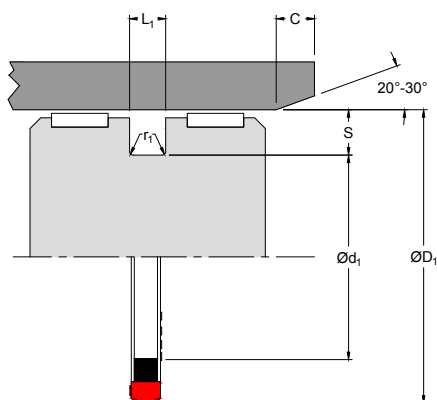
NOTE

Figures show the maximum permissible gap all on one side using minimum rod $\varnothing$ and maximum clearance $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing D_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing d_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII				
Groove Section $\leq S$ in	0.154	0.269	0.373	0.431
Min Chamfer C in	0.100	0.150	0.200	0.200
Max Fillet Rad r_1 in	0.016	0.016	0.016	0.016

TOLERANCES	$\varnothing D_1$	$\varnothing d_1$	L_1
$L_1 = 0.129$ in	H9	js10	± 0.002
$L_1 = 0.283$ in	H9	js10	± 0.003
$L_1 > 0.283$ in	H9	js10	± 0.004



755

PISTON SEAL

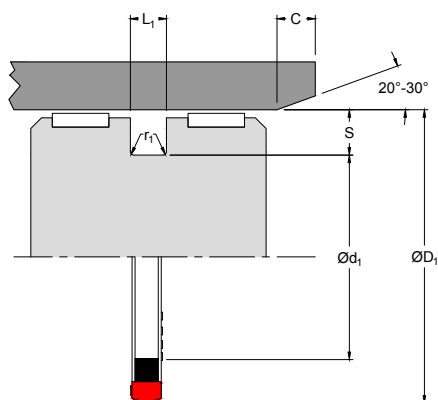
*Double-Acting
Polyester Face with Rubber Energizer*

PART NUMBER RANGE

INCH						
ØD ₁	TOL H9	Ød ₁	TOL js10	L ₁	TOL	PART No.
1.000	+0.002 0.000	0.691	+0.001 -0.001	0.129	+0.002 -0.002	8910000
1.250	+0.003 0.000	0.941	+0.002 -0.002	0.129	+0.002 -0.002	8910100
1.500	+0.003 0.000	1.191	+0.002 -0.002	0.129	+0.002 -0.002	8910200
1.750	+0.003 0.000	1.441	+0.002 -0.002	0.129	+0.002 -0.002	8910300
2.000	+0.003 0.000	1.462	+0.002 -0.002	0.283	+0.003 -0.003	4553520
2.000	+0.003 0.000	1.606	+0.002 -0.002	0.129	+0.002 -0.002	8913100*
2.000	+0.003 0.000	1.691	+0.002 -0.002	0.129	+0.002 -0.002	8910400
2.250	+0.003 0.000	1.941	+0.002 -0.002	0.129	+0.002 -0.002	8910500
2.500	+0.003 0.000	1.962	+0.002 -0.002	0.283	+0.003 -0.003	4490020
2.500	+0.003 0.000	2.106	+0.002 -0.002	0.129	+0.002 -0.002	4439310*
2.500	+0.003 0.000	2.191	+0.002 -0.002	0.129	+0.002 -0.002	8910600
2.750	+0.003 0.000	2.441	+0.002 -0.002	0.129	+0.002 -0.002	8910700
3.000	+0.003 0.000	2.462	+0.002 -0.002	0.283	+0.003 -0.003	8910800
3.250	+0.004 0.000	2.712	+0.002 -0.002	0.283	+0.003 -0.003	8910900
3.500	+0.004 0.000	2.962	+0.002 -0.002	0.283	+0.003 -0.003	8911000

NOTE

Part numbers suffixed by "*" are supplied with an O-ring energiser.

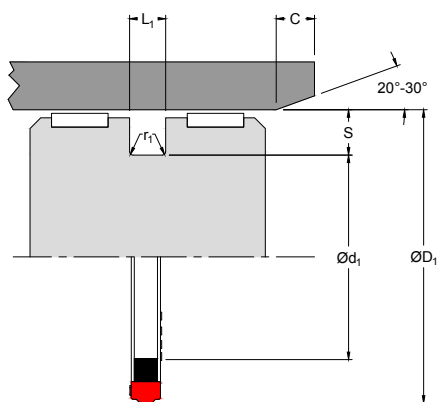


PART NUMBER RANGE

INCH						
ØD ₁	TOL H9	Ød ₁	TOL js10	L ₁	TOL	PART No.
3.750	+0.004 0.000	3.212	+0.003 -0.003	0.283	+0.003 -0.003	8911100
4.000	+0.004 0.000	3.462	+0.003 -0.003	0.283	+0.003 -0.003	8911200
4.250	+0.004 0.000	3.712	+0.003 -0.003	0.283	+0.003 -0.003	8911300
4.500	+0.004 0.000	3.962	+0.003 -0.003	0.283	+0.003 -0.003	8911400
4.750	+0.004 0.000	4.212	+0.003 -0.003	0.283	+0.003 -0.003	8911500
5.000	+0.004 0.000	4.462	+0.003 -0.003	0.283	+0.003 -0.003	8911600
5.250	+0.004 0.000	4.504	+0.003 -0.003	0.378	+0.004 -0.004	8911700
5.500	+0.004 0.000	4.754	+0.003 -0.004	0.378	+0.004 -0.004	8911800
5.750	+0.004 0.000	5.004	+0.003 -0.004	0.378	+0.004 -0.004	8913200
6.000	+0.004 0.000	5.254	+0.003 -0.004	0.378	+0.004 -0.004	8911900
6.250	+0.004 0.000	5.504	+0.003 -0.004	0.378	+0.004 -0.004	8912000
6.500	+0.004 0.000	5.754	+0.003 -0.004	0.378	+0.004 -0.004	8912100
7.000	+0.004 0.000	6.250	+0.003 -0.004	0.312	+0.004 -0.004	4394810*
7.000	+0.004 0.000	6.254	+0.003 -0.004	0.378	+0.004 -0.004	8912200
7.250	+0.004 0.000	6.504	+0.003 -0.004	0.378	+0.004 -0.004	8912300

NOTE

Part numbers suffixed by "*" are supplied with an O-ring energiser.



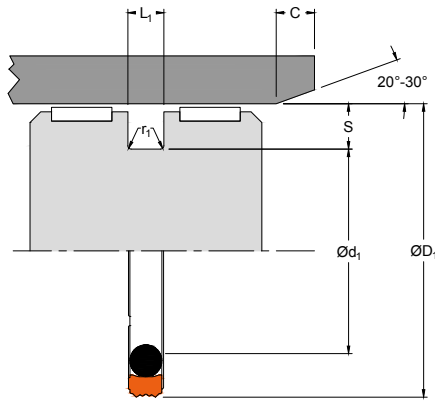
755

PISTON SEAL

*Double-Acting
Polyester Face with Rubber Energizer*

PART NUMBER RANGE

INCH						
ØD ₁	TOL H9	Ød ₁	TOL js10	L ₁	TOL	PART No.
7.500	+0.004 0.000	6.754	+0.003 -0.004	0.378	+0.004 -0.004	8912400
8.000	+0.004 0.000	7.254	+0.004 -0.004	0.378	+0.004 -0.004	8912500
8.437	+0.004 0.000	7.691	+0.004 -0.004	0.378	+0.004 -0.004	8913000
8.500	+0.004 0.000	7.754	+0.004 -0.004	0.378	+0.004 -0.004	8912600
9.000	+0.004 0.000	8.137	+0.004 -0.004	0.378	+0.004 -0.004	8912700
9.500	+0.004 0.000	8.637	+0.004 -0.004	0.378	+0.004 -0.004	8912800
10.000	+0.005 0.000	9.137	+0.004 -0.004	0.378	+0.004 -0.004	8912900
NOTE Part numbers suffixed by "X" are supplied with an O-ring energiser.						



764

PISTON SEAL

*Double-Acting
Polyurethane Face with Pre-Loaded O-Ring*

DESIGN

The Hallite 764 double-acting piston seal is a compact, low friction seal for light to medium duty applications. The advanced face geometry gives the Hallite 764 single-acting capabilities making it an excellent choice for double-acting applications where minimal dynamic leakage is required.

The Hallite 764 is comprised of a tough, wear resistance-thermoplastic polyurethane face seal which is pre-loaded by a NBR O-ring. The housing width allows a narrow width piston to be used.

We recommend that an adequate bearing, such as the Hallite 506 or 87 bearing strip, is mounted on one or both sides of the seal. For further details of bearing grooves, please refer to the appropriate product data sheet.



FEATURES

- Double-acting seal with single-acting capabilities
- Advanced face geometry provides enhanced dynamic and static sealing
- Excellent wear resistance and high extrusion resistance
- More tolerant to contamination
- Rapid recovery after assembly
- Operates on wide range of surface finishes
- Ideal for use with Hallite 506 or 87 bearing

MATERIALS

As standard, this product comes in the following materials. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Face Type	Face Color
Standard	Hythane® 361- NBR	TPU-AU	Orange



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-30°C +110°C	-22°F +230°F
Maximum Pressure	250 bar	3600 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

MAXIMUM EXTRUSION GAP			
Pressure bar	100	160	250
Maximum Gap mm	0.60	0.50	0.40
Pressure psi	1500	2400	3750
Maximum Gap in	0.024	0.020	0.016

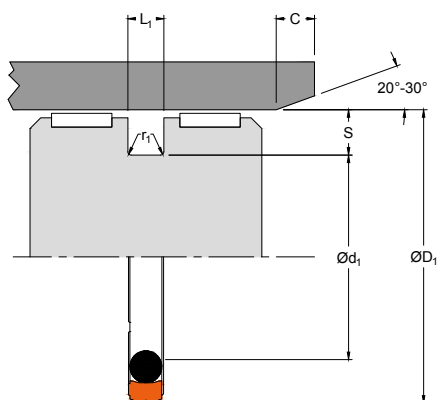
NOTE

Figures show the maximum permissible gap all on one side using minimum rod $\varnothing$ and maximum clearance $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing D_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing d_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII				
Groove Section $\leq S$ mm	3.75	5.50	7.75	10.50
Min Chamfer C mm	2.00	2.50	5.00	5.00
Max Fillet Rad r_1 mm	0.40	0.80	1.20	1.60
Groove Section $\leq S$ in	0.150	0.220	0.310	0.410
Min Chamfer C in	0.080	0.100	0.200	0.200
Max Fillet Rad r_1 in	0.016	0.032	0.047	0.063

TOLERANCES	$\varnothing D_1$	$\varnothing d_1$	L_1
mm	H9	h9	+0.20 -0
in	H9	h9	+0.008 -0



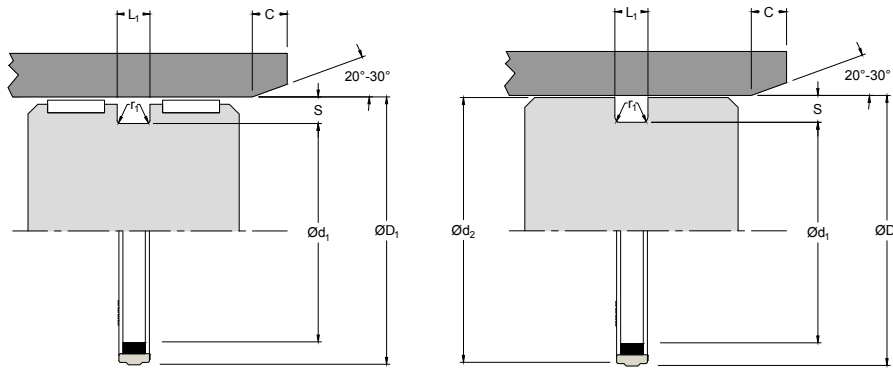
764

PISTON SEAL

*Double-Acting
Polyurethane Face with Pre-Loaded O-Ring*

PART NUMBER RANGE

INCH					
ØD ₁	TOL H9	Ød ₁	TOL h9	L ₁ +0.008-0	PART No.
1.250	+0.003 0.000	0.817	0.000 -0.002	0.165	4751210
1.375	+0.003 0.000	0.942	0.000 -0.002	0.165	4764110
1.500	+0.003 0.000	1.067	0.000 -0.002	0.165	4764210
2.000	+0.003 0.000	1.390	0.000 -0.003	0.248	4764810
2.125	+0.003 0.000	1.515	0.000 -0.003	0.248	4765410
2.500	+0.003 0.000	1.890	0.000 -0.003	0.248	4766810
2.750	+0.003 0.000	2.140	0.000 -0.003	0.248	4759710
2.750	+0.003 0.000	2.318	0.000 -0.003	0.165	4741410
3.000	+0.003 0.000	2.390	0.000 -0.003	0.248	4767110



770

PISTON SEAL

*Double-Acting
Polyester Face with
Rubber Energizer for O-Ring Housings*

DESIGN

The Hallite 770 double-acting piston seal is a compact, low friction seal for light to medium-duty applications designed to fit standard inch O-ring housings.

The Hallite 770 is comprised of a tough, self-lubricated thermoplastic elastomeric face seal which is pre-loaded by a rectangular cross-section NBR expander. The standard material is only suitable for hydraulic mineral oil applications. Other material options are available for water-based (HFA and HFB) fluids and synthetic esters (HEES). For intermittent single-acting applications and in certain sizes, we recommend using Hythane® 181 for the face material.

The Hallite 770 can be used on SG iron pistons or on pistons where there is an adequate remote bearing, such as the Hallite 506, 533, and 87 bearings. For further details of bearing grooves, please refer to the appropriate product data sheet.



FEATURES

- Low breakout and low operating friction levels
- Excellent wear resistance
- More tolerant to contamination
- Rapid recovery after assembly
- Operates on wide range of surface finishes
- Ideal for use with Hallite 506, 533, or 87 bearing

MATERIALS

This product comes in a number of material options to extend operating conditions. Contact your local Hallite technical team to decide which is best for your application. Use the part designator in the table below as the last digit of the part number to specify material choice when ordering. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Face Type	Face Color	Part Designator
Standard	TPE 261 - NBR	TPE	Cream	2
Optional	TPE 061 - NBR	TPE	Red	0
Optional	TPE 111 - NBR	TPE	Grey	1
Optional	TPE 051 - NBR	TPE	Dark Red	3
Optional - Limited Size Range	Hythane® 181 - NBR	TPU-EU	Blue	4



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-40°C +110°C	-40°F +230°F
Maximum Pressure	350 bar	5000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

NOTE

Technical details shown are for the standard material TPE 261.

MAXIMUM EXTRUSION GAP				
Pressure bar	100	160	250	350
Maximum Gap mm	0.75	0.64	0.50	0.25
Pressure psi	1500	2400	3750	5000
Maximum Gap in	0.030	0.025	0.020	0.010

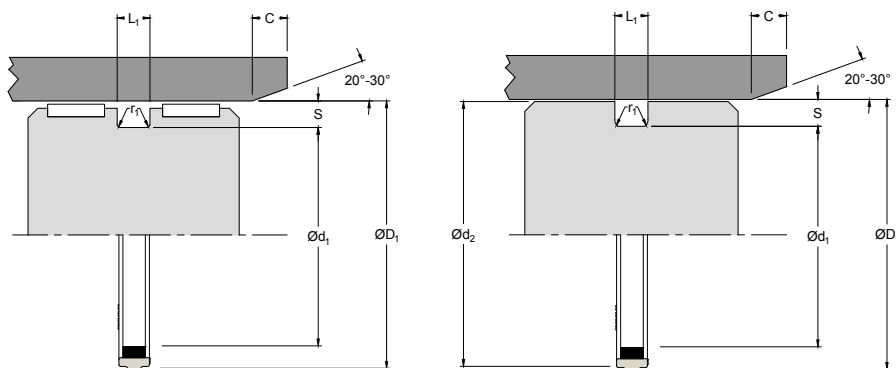
NOTE

Figures show the maximum permissible gap all on one side using minimum rod $\varnothing$ and maximum clearance $\varnothing$. Refer to Housing Design section. Technical details shown are for standard cream 55D lubricated polyester elastomer.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing D_1$	0.1 - 0.4	1.6 max	4 max	4-16	63 max	157 max
Static Sealing Face $\varnothing d_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII			
Groove Section $\leq S$ in	0.125	0.187	0.250
Min Chamfer C in	0.100	0.150	0.200
Max Fillet Rad r_1 in	0.016	0.016	0.016

TOLERANCES	$\varnothing D_1$	$\varnothing d_1$	$\varnothing d_2$	L_1
in	+0.002 -0	+0 -0.002	+0 -0.001	+0.005 -0



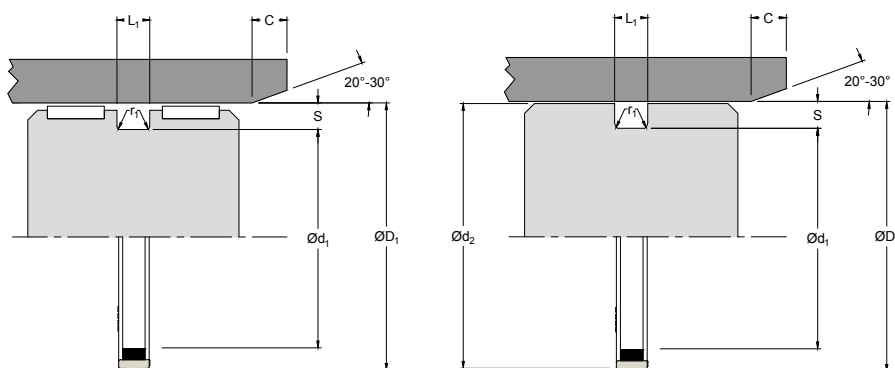
770

PISTON SEAL

*Double-Acting
Polyester Face with
Rubber Energizer for O-Ring Housings*

PART NUMBER RANGE

INCH					
ØD ₁	TOL	Ød ₁ +0-0.002	Ød ₂ +0-0.001	L ₁ +0.005-0	PART No.
0.750	+0.002 0.000	0.508	0.747	0.187	4817712
0.875	+0.002 0.000	0.633	0.872	0.187	4817812
1.000	+0.002 0.000	0.758	0.997	0.187	4817912
1.125	+0.002 0.000	0.883	1.122	0.187	4818012
1.250	+0.002 0.000	1.008	1.247	0.187	4554412
1.375	+0.002 0.000	1.133	1.372	0.187	4716912
1.500	+0.002 0.000	1.258	1.497	0.187	4717012
1.625	+0.002 0.000	1.383	1.622	0.187	4717112
1.750	+0.002 0.000	1.508	1.747	0.187	4717212
2.000	+0.002 0.000	1.630	1.997	0.281	4553512
2.125	+0.002 0.000	1.755	2.122	0.281	4717312
2.250	+0.002 0.000	1.880	2.247	0.281	4717412
2.500	+0.002 0.000	2.130	2.497	0.281	4490012
2.750	+0.002 0.000	2.380	2.747	0.281	4817512
2.875	+0.002 0.000	2.505	2.872	0.281	4817612
3.000	+0.002 0.000	2.630	2.997	0.281	4349412



770

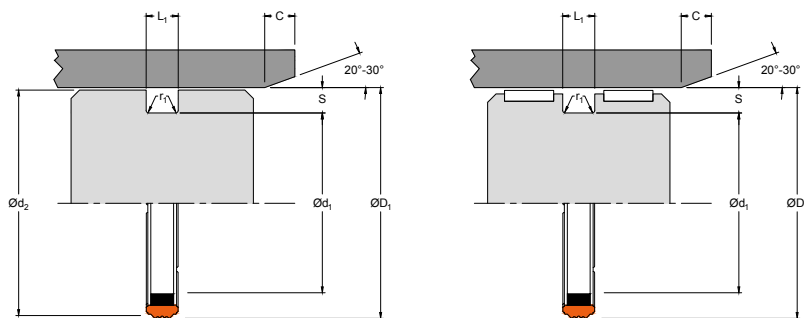
PISTON SEAL

*Double-Acting
Polyester Face with
Rubber Energizer for O-Ring Housings*

PART NUMBER RANGE

INCH					
ØD ₁	TOL	Ød ₁ +0-0.002	Ød ₂ +0-0.001	L ₁ +0.005-0	PART No.
3.250	+0.002 0.000	2.880	3.247	0.281	4349512
3.500	+0.002 0.000	3.130	3.497	0.281	4349612
3.750	+0.002 0.000	3.380	3.747	0.281	4349712
4.000	+0.002 0.000	3.630	3.997	0.281	4349812
4.250	+0.002 0.000	3.880	4.247	0.281	4349912
4.500	+0.002 0.000	4.130	4.497	0.281	4350012
4.750	+0.002 0.000	4.380	4.747	0.281	4350112
5.000	+0.004 0.000	4.630	4.997	0.281	4350212
5.250	+0.004 0.000	4.778	5.247	0.375	4350322
5.500	+0.004 0.000	5.028	5.497	0.375	4350422
6.000	+0.004 0.000	5.528	5.997	0.375	4350522
6.250	+0.004 0.000	5.778	6.247	0.375	4350622
6.500	+0.004 0.000	6.028	6.497	0.375	4350722
7.000	+0.004 0.000	6.528	6.997	0.375	4350822
8.000	+0.004 0.000	7.528	7.997	0.375	4351122





775

PISTON SEAL

*Double-Acting
Polyurethane Face with Rubber
Energizer for O-Ring Housings*



DESIGN

The Hallite 775 double-acting piston seal is a compact seal for light to medium-duty applications and designed to fit two housing standards; one for standard O-ring grooves, the second for grooves designed for an O-ring and two back-up rings. The advanced face geometry gives the Hallite 775 single-acting capabilities making it an excellent choice for double-acting applications where minimal dynamic leakage is required.

The Hallite 775 is comprised of a tough polyurethane face seal which is pre-loaded by a rectangular cross-section NBR expander. The standard material is suitable for hydraulic mineral oil applications.

The Hallite 775 can be used on SG iron pistons or on pistons where there is an adequate remote bearing, such as the Hallite 506, 533, and 87 bearings.

FEATURES

- Double-acting seal with single-acting capabilities
- Advanced face geometry provides enhanced dynamic and static sealing
- Excellent wear resistance and high extrusion resistance
- More tolerant to contamination
- Rapid recovery after assembly
- Operates on wide range of surface finishes
- Ideal for use with Hallite 506, 533, or 87 bearing

MATERIALS

As standard, this product comes in the following materials. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Face Type	Face Color
Standard	Hythane® 361-NBR	TPU-AU	Orange



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-30°C +110°C	-22°F +230°F
Maximum Pressure	350 bar	5000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

MAXIMUM EXTRUSION GAP				
Pressure bar	100	160	250	350
Maximum Gap mm	0.64	0.50	0.40	0.20
Pressure psi	1500	2400	3750	5000
Maximum Gap in	0.025	0.020	0.016	0.008

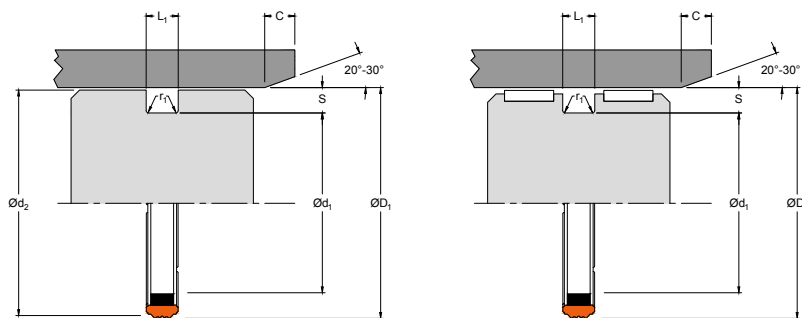
NOTE

Figures show the maximum permissible gap all on one side using minimum rod $\varnothing$ and maximum clearance $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing D_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing d_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

RADII			
Groove Section $\leq S$ in	0.125	0.187	0.250
Min Chamfer C in	0.100	0.150	0.200
Max Fillet Rad r_1 in	0.016	0.016	0.016

TOLERANCES	$\varnothing D_1$	$\varnothing d_1$	$\varnothing d_2$	L_1
$\varnothing D_1 \leq 2.500$ in	+0.003 -0	+0 -0.003	+0 -0.001	+0.005 -0
$\varnothing D_1 > 2.500$ in	+0.004 -0	+0 -0.004	+0 -0.001	+0.005 -0



775

PISTON SEAL

*Double-Acting
Polyurethane Face with Rubber
Energizer for O-Ring Housings*

PART NUMBER RANGE

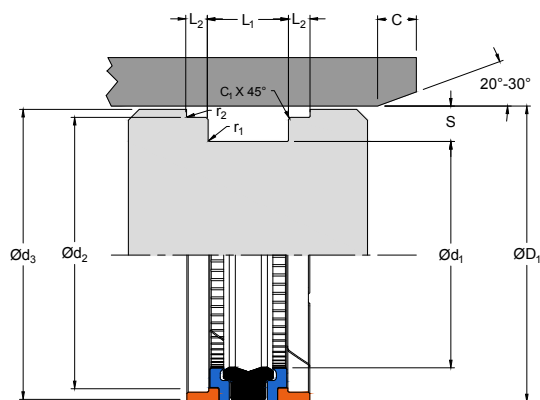
HOUSINGS TO SUIT STANDARD O-RING - INCH							
ØD ₁	TOL	Ød ₁	TOL	Ød ₂ +0-0.001	L ₁ +0.005-0	O-RING	PART No.
1.375	+0.003 0.000	1.133	0.000 -0.003	1.372	0.187	216	4763516
1.500	+0.003 0.000	1.258	0.000 -0.003	1.497	0.187	218	4731816
1.750	+0.003 0.000	1.508	0.000 -0.003	1.747	0.187	222	4750716
2.000	+0.003 0.000	1.630	0.000 -0.003	1.997	0.281	326	4731016
2.500	+0.003 0.000	2.130	0.000 -0.003	2.497	0.281	330	4731116
3.000	+0.004 0.000	2.630	0.000 -0.004	2.997	0.281	334	4731216
3.500	+0.004 0.000	3.130	0.000 -0.004	3.497	0.281	338	4731316
4.000	+0.004 0.000	3.630	0.000 -0.004	3.997	0.281	342	4731416
5.000	+0.004 0.000	4.630	0.000 -0.004	4.997	0.281	425	4731516

HOUSINGS TO SUIT STANDARD O-RING WITH TWO BACK-UP RINGS - INCH							
ØD ₁	TOL	Ød ₁	TOL	Ød ₂ +0-0.001	L ₁ +0.005-0	O-RING	PART No.
1.500	+0.003 0.000	1.258	0.000 -0.003	1.497	0.275	218	4730516
2.000	+0.003 0.000	1.630	0.000 -0.003	1.997	0.410	326	4733716
2.500	+0.003 0.000	2.130	0.000 -0.003	2.497	0.410	330	4726916
3.000	+0.004 0.000	2.630	0.000 -0.004	2.997	0.410	334	4733816
3.500	+0.004 0.000	3.130	0.000 -0.004	3.497	0.410	338	4733916
4.000	+0.004 0.000	3.630	0.000 -0.004	3.997	0.410	342	4734016
5.000	+0.004 0.000	4.528	0.000 -0.004	4.997	0.538	425	4730616
6.000	+0.004 0.000	5.528	0.000 -0.004	5.997	0.538	433	4734116

PART NUMBERS ON THIS PAGE ARE LISTED IN THE STANDARD MATERIAL OPTION. FOR MATERIAL VARIATIONS OR FOR CUSTOM SIZES, MATERIALS, OR SEAL DESIGNS, PLEASE CONTACT YOUR LOCAL HALLITE REPRESENTATIVE.



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780

PISTON SEAL

*Double-Acting
Five Part Assembly*

DESIGN

The Hallite 780 double-acting piston seal in a robust five part assembly is designed specifically for one piece pistons in a wide range of medium duty applications. The seal is also suitable for two piece pistons.

The Hallite 780 is comprised of a nitrile rubber sealing element, two split support rings, and two split L-shaped bearings located either side of the seal. The well-proven nitrile rubber sealing element is designed to be extremely wear resistant with multi-lips for efficient dynamic sealing with minimal low pressure friction and, when pressurized, will be protected from extrusion damage by the extending lips of the support rings.

The support ring is manufactured from a tough, flexible, wear resistant thermoplastic polyester elastomer (TPE) and scarf cut for assembly.

Both the L-shaped bearings and support rings are grooved to ensure that the fluid pressure properly energizes the sealing element and to prevent the possibility of any pressure trapping within the seal assembly.



FEATURES

- Excellent position holding characteristics under load
- Excellent on a variety of tube surface finishes
- Extremely well proven in a variety of applications using hydraulic oil
- Extremely wear resistant
- Low friction

MATERIALS

As standard, this product comes in the following materials. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Color
Standard	Nitrile 1411-Polyester-POM	Black-Blue-Orange



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	0.5 m/sec	1.5 ft/sec
Temperature Range	-30°C +100°C	-22°F +212°F
Maximum Pressure	400 bar	6000 psi

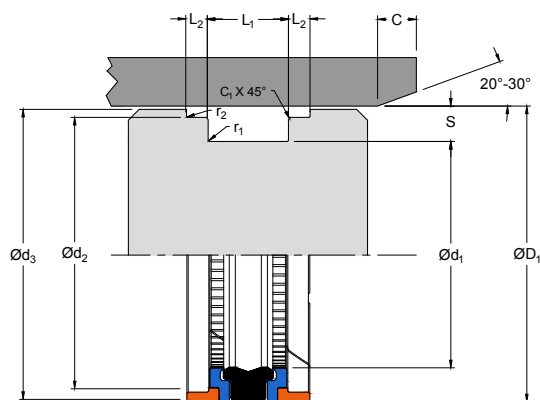
NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

SURFACE ROUGHNESS	µmRa	µmRz	µmRt	µinRa	µinRz	µinRt
Dynamic Sealing Face ØD ₁	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face Ød ₁	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L ₁	3.2 max	10 max	16 max	125 max	394 max	630 max

RADII						
Groove Section ≤ S mm	5.00	7.50	8.00	10.00	12.50	15.00
Min Chamfer C mm	2.40	4.00	5.00	5.00	6.50	7.50
Max Chamfer C ₁ mm	0.40	0.40	0.40	0.80	0.80	0.80
Max Fillet Rad r ₁ mm	0.40	0.40	0.40	0.40	0.80	0.80
Max Fillet Rad r ₂ mm	0.40	0.40	0.40	0.40	0.80	0.80
Groove Section ≤ S in	0.312	0.375	0.500			
Min Chamfer C in	0.156	0.187	0.217			
Max Chamfer C ₁ in	0.016	0.032	0.032			
Max Fillet Rad r ₁ in	0.016	0.016	0.032			
Max Fillet Rad r ₂ in	0.016	0.016	0.032			

TOLERANCES	ØD ₁	Ød ₁	Ød ₂	Ød ₃	L ₁	L ₂
mm	H9	h9	h9	h11	+0.20 -0	+0.10 -0
in	H9	h9	h9	h11	+0.016 +0.005	+0.004 -0



780

PISTON SEAL

Double-Acting
Five Part Assembly

PART NUMBER RANGE

INCH										
$\text{Ø}D_1$	TOL H9	$\text{Ø}d_1$	TOL h9	$\text{Ø}d_2$	TOL h9	$\text{Ø}d_3$	TOL h11	L_1 +0.016 +0.005	L_2 +0.004-0	PART No.
1.750	+0.003 0.000	1.380	0.000 -0.003	1.640	0.000 -0.003	1.720	0.000 -0.006	0.490	0.240	5008510
2.000	+0.003 0.000	1.375	0.000 -0.003	1.820	0.000 -0.003	1.950	0.000 -0.006	0.750	0.250	5010910
2.000	+0.003 0.000	1.625	0.000 -0.003	1.888	0.000 -0.003	1.970	0.000 -0.006	0.490	0.240	5010010
2.250	+0.003 0.000	1.625	0.000 -0.003	2.070	0.000 -0.003	2.200	0.000 -0.007	0.750	0.250	5011010
2.375	+0.003 0.000	1.750	0.000 -0.003	2.196	0.000 -0.003	2.325	0.000 -0.007	0.760	0.250	5001030
2.500	+0.003 0.000	1.875	0.000 -0.003	2.320	0.000 -0.003	2.450	0.000 -0.007	0.750	0.250	5011110
2.500	+0.003 0.000	2.000	0.000 -0.003	2.320	0.000 -0.003	2.470	0.000 -0.007	0.650	0.240	5010110
3.000	+0.003 0.000	2.250	0.000 -0.003	2.773	0.000 -0.003	2.940	0.000 -0.007	0.937	0.250	5011210
3.000	+0.003 0.000	2.375	0.000 -0.003	2.772	0.000 -0.003	2.970	0.000 -0.007	0.778	0.240	5010210
3.500	+0.004 0.000	2.750	0.000 -0.003	3.273	0.000 -0.004	3.440	0.000 -0.009	0.937	0.250	5011310
3.500	+0.004 0.000	2.852	0.000 -0.003	3.272	0.000 -0.004	3.470	0.000 -0.009	0.778	0.290	5010310
4.000	+0.004 0.000	3.250	0.000 -0.004	3.772	0.000 -0.004	3.940	0.000 -0.009	0.937	0.250	5011410
4.000	+0.004 0.000	3.376	0.000 -0.004	3.772	0.000 -0.004	3.970	0.000 -0.009	0.778	0.240	5010410
4.500	+0.004 0.000	3.500	0.000 -0.004	4.231	0.000 -0.004	4.428	0.000 -0.009	1.250	0.250	5011510
4.500	+0.004 0.000	3.876	0.000 -0.004	4.272	0.000 -0.004	4.470	0.000 -0.009	0.778	0.240	5010510
5.000	+0.004 0.000	4.000	0.000 -0.004	4.711	0.000 -0.004	4.910	0.000 -0.010	1.250	0.375	5011610
5.000	+0.004 0.000	4.252	0.000 -0.004	4.772	0.000 -0.004	4.970	0.000 -0.010	0.958	0.240	5010610
6.000	+0.004 0.000	5.000	0.000 -0.004	5.711	0.000 -0.004	5.910	0.000 -0.010	1.250	0.375	5011710

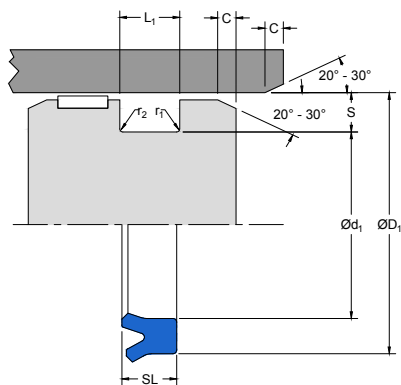
PART NUMBERS ON THIS PAGE ARE LISTED IN THE STANDARD MATERIAL OPTION. FOR MATERIAL VARIATIONS OR FOR CUSTOM SIZES, MATERIALS, OR SEAL DESIGNS, PLEASE CONTACT YOUR LOCAL HALLITE REPRESENTATIVE.



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SINGLE-ACTING PISTON SEALS



606

PISTON SEAL

*Single-Acting
Polyurethane, Single Lip*

DESIGN

The Hallite 606 single-acting, single lip asymmetric piston seal is designed with precision trimmed sealing lips to provide effective bore sealing in light and medium-duty applications. The seal can be considered for use in heavy-duty applications when used with a suitable full depth back-up ring. The sealing lips are trimmed at an angle to give optimal rod sealing performance.

The range covers most standard housings used in Europe, North America and Asia.

The Hallite 606 is designed to have an interference in the seal housing groove. The outer dynamic lip is shorter and more robust to improving sealing and compression set characteristics over conventional, symmetrical U-rings.

The seal is recommended for use in single-acting piston seal applications. It can also be fitted back-to-back in separate grooves for use in double-acting applications.

The Hallite 606 is molded in Hythane® 181, Hallite's high-performance polyurethane, for easy installation and excellent low temperature performance.



FEATURES

- General purpose seal
- Robust design
- Excellent wear resistance
- Performs well over wide temperature range and is extremely effective in low temperatures
- Easy to install

MATERIALS

As standard, this product comes in the following material. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color
Standard	Hythane® 181	TPU-EU	Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-45°C +110°C	-50°F +230°F
Maximum Pressure	400 bar	6000 psi
Maximum Pressure with Backup Ring	700 bar	10000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

NOTE

Pressure Rating: Can be extended with use of back-up ring. Seek technical advice from local Hallite office.

MAXIMUM EXTRUSION GAP			
Pressure bar	160	250	400
Maximum Gap mm	0.60	0.50	0.40
Pressure psi	2400	3750	6000
Maximum Gap in	0.024	0.020	0.016

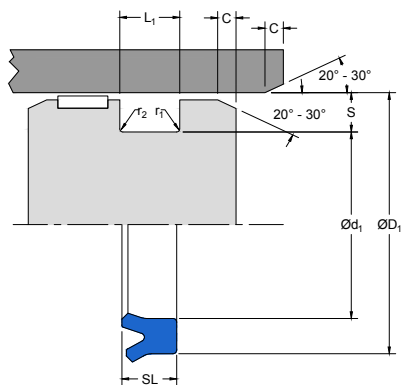
NOTE

Figures show the maximum permissible gap all on one side, for rod seals using minimum rod $\varnothing$ and maximum clearance $\varnothing$ and for piston seals using the minimum clearance $\varnothing$ and maximum bore $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing D_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing d_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII						
Groove Section $< S$ mm	4.00	5.00	7.50	10.00	12.50	15.00
Min Chamfer C mm	3.00	3.50	5.00	6.50	7.00	8.00
Max Fillet Rad r_1 mm	0.20	0.40	0.80	0.80	1.20	1.60
Max Fillet Rad r_2 mm	0.40	0.80	1.20	1.20	1.60	2.40
Groove Section $\leq S$ in	0.125	0.187	0.250	0.312	0.375	0.500
Min Chamfer C in	0.093	0.093	0.125	0.156	0.187	0.187
Max Fillet Rad r_1 in	0.008	0.008	0.016	0.032	0.032	0.032
Max Fillet Rad r_2 in	0.016	0.016	0.032	0.047	0.047	0.047

TOLERANCES	$\varnothing D_1$	$\varnothing d_1$	L_1
mm	H9	js11	+0.25 -0
in	H9	js11	+0.010 -0



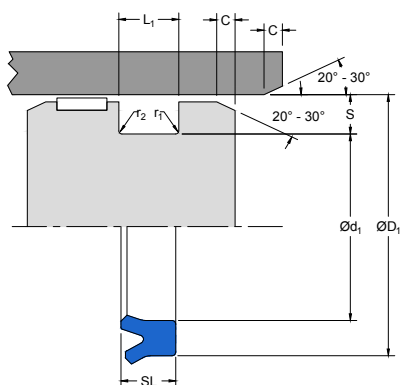
606

PISTON SEAL

Single-Acting
Polyurethane, Single Lip

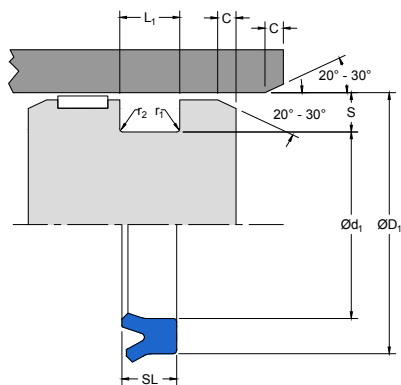
PART NUMBER RANGE

INCH						
ØD ₁	TOL H9 0.000	Ød ₁	TOL js11 -0.002	L ₁ +0.010-0	SL	PART No.
0.750	+0.002 0.000	0.375	+0.002 -0.002	0.313	0.344	4707100
1.125	+0.002 0.000	0.750	+0.003 -0.003	0.313	0.344	4565600
1.250	+0.003 0.000	0.875	+0.003 -0.003	0.250	0.275	4800300
1.500	+0.003 0.000	1.125	+0.003 -0.003	0.250	0.275	4426700
1.500	+0.003 0.000	1.250	+0.003 -0.003	0.250	0.275	4426800
1.750	+0.003 0.000	1.500	+0.003 -0.003	0.250	0.275	4769800
2.000	+0.003 0.000	1.375	+0.003 -0.003	0.500	0.550	4364200
2.000	+0.003 0.000	1.500	+0.003 -0.003	0.375	0.413	4376000
2.000	+0.003 0.000	1.625	+0.003 -0.003	0.187	0.207	4426900
2.000	+0.003 0.000	1.625	+0.003 -0.003	0.312	0.344	4444300
2.000	+0.003 0.000	1.625	+0.003 -0.003	0.375	0.413	4364400
2.250	+0.003 0.000	1.750	+0.003 -0.003	0.375	0.413	4476500
2.250	+0.003 0.000	1.875	+0.003 -0.003	0.375	0.413	4479600
2.500	+0.003 0.000	1.625	+0.003 -0.003	0.500	0.550	4364500
2.500	+0.003 0.000	1.875	+0.003 -0.003	0.500	0.550	4376100
2.500	+0.003 0.000	2.000	+0.004 -0.004	0.250	0.275	4516500



PART NUMBER RANGE

INCH						
ØD ₁	TOL H9	Ød ₁	TOL js11	L ₁ +0.010-0	SL	PART No.
2.500	+0.003 0.000	2.000	+0.004 -0.004	0.375	0.413	4391900
2.500	+0.003 0.000	2.125	+0.004 -0.004	0.250	0.275	4427000
2.500	+0.003 0.000	2.125	+0.004 -0.004	0.312	0.344	4444400
2.500	+0.003 0.000	2.125	+0.004 -0.004	0.375	0.413	4451300
3.000	+0.003 0.000	2.250	+0.004 -0.004	0.455	0.500	4375000
3.000	+0.003 0.000	2.375	+0.004 -0.004	0.500	0.550	4364600
3.000	+0.003 0.000	2.500	+0.004 -0.004	0.250	0.275	4516600
3.000	+0.003 0.000	2.500	+0.004 -0.004	0.375	0.413	4364700
3.000	+0.003 0.000	2.625	+0.004 -0.004	0.187	0.207	4792800
3.000	+0.003 0.000	2.625	+0.004 -0.004	0.375	0.413	4458400
3.250	+0.004 0.000	2.625	+0.004 -0.004	0.500	0.550	4376200
3.250	+0.004 0.000	2.750	+0.004 -0.004	0.250	0.275	4516700
3.250	+0.004 0.000	2.750	+0.004 -0.004	0.375	0.413	4474400
3.250	+0.004 0.000	2.875	+0.004 -0.004	0.250	0.275	4427100
3.500	+0.004 0.000	2.750	+0.004 -0.004	0.500	0.550	4444600
3.500	+0.004 0.000	2.750	+0.004 -0.004	0.625	0.688	4376300



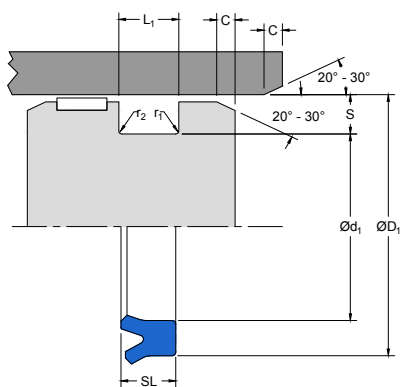
606

PISTON SEAL

Single-Acting
Polyurethane, Single Lip

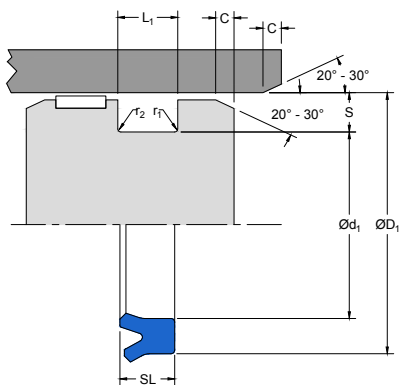
PART NUMBER RANGE

INCH						
ØD ₁	TOL H9	Ød ₁	TOL js11	L ₁ +0.010-0	SL	PART No.
3.500	+0.004 0.000	2.875	+0.004 -0.004	0.312	0.344	4571100
3.500	+0.004 0.000	2.875	+0.004 -0.004	0.500	0.550	4364800
3.500	+0.004 0.000	3.000	+0.004 -0.004	0.250	0.275	4516800
3.500	+0.004 0.000	3.000	+0.004 -0.004	0.375	0.413	4364900
3.500	+0.004 0.000	3.125	+0.004 -0.004	0.275	0.302	4572200
3.500	+0.004 0.000	3.125	+0.004 -0.004	0.375	0.413	4444500
3.750	+0.004 0.000	3.250	+0.004 -0.004	0.375	0.413	4444700
4.000	+0.004 0.000	3.250	+0.004 -0.004	0.375	0.413	4517400
4.000	+0.004 0.000	3.250	+0.004 -0.004	0.500	0.550	4444900
4.000	+0.004 0.000	3.250	+0.004 -0.004	0.625	0.688	4376400
4.000	+0.004 0.000	3.375	+0.004 -0.004	0.500	0.550	4365000
4.000	+0.004 0.000	3.500	+0.004 -0.004	0.250	0.275	4516900
4.000	+0.004 0.000	3.500	+0.004 -0.004	0.312	0.344	4427200
4.000	+0.004 0.000	3.500	+0.004 -0.004	0.375	0.413	4365100
4.000	+0.004 0.000	3.625	+0.004 -0.004	0.375	0.413	4444800
4.250	+0.004 0.000	3.750	+0.004 -0.004	0.375	0.413	4445000



PART NUMBER RANGE

INCH						
ØD ₁	TOL H9	Ød ₁	TOL js11	L ₁ +0.010-0	SL	PART No.
4.500	+0.004 0.000	3.750	+0.004 -0.004	0.625	0.688	4371000
4.500	+0.004 0.000	4.000	+0.004 -0.004	0.375	0.413	4448100
4.750	+0.004 0.000	4.379	+0.004 -0.004	0.275	0.302	4493600
5.000	+0.004 0.000	4.250	+0.004 -0.004	0.375	0.413	4517500
5.000	+0.004 0.000	4.250	+0.004 -0.004	0.500	0.550	4445100
5.000	+0.004 0.000	4.250	+0.004 -0.004	0.625	0.688	4371100
5.000	+0.004 0.000	4.500	+0.004 -0.004	0.250	0.275	4517000
5.000	+0.004 0.000	4.500	+0.004 -0.004	0.375	0.413	4365200
5.000	+0.004 0.000	4.500	+0.004 -0.004	0.562	0.619	4495900
5.250	+0.004 0.000	4.500	+0.004 -0.004	0.500	0.550	4445200
5.500	+0.004 0.000	4.750	+0.005 -0.005	0.625	0.688	4371200
6.000	+0.004 0.000	5.250	+0.005 -0.005	0.375	0.413	4517600
6.000	+0.004 0.000	5.250	+0.005 -0.005	0.500	0.550	4445300
6.000	+0.004 0.000	5.250	+0.005 -0.005	0.625	0.688	4371300
6.000	+0.004 0.000	5.500	+0.005 -0.005	0.250	0.275	4517100
6.000	+0.004 0.000	5.500	+0.005 -0.005	0.375	0.413	4365300



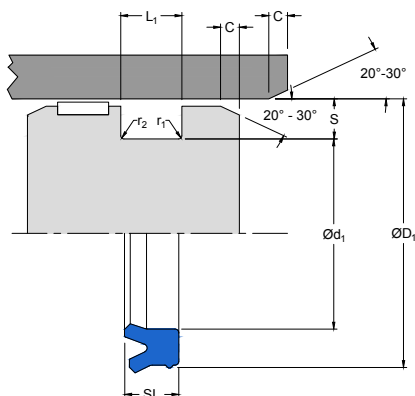
606

PISTON SEAL

*Single-Acting
Polyurethane, Single Lip*

PART NUMBER RANGE

INCH						
$ØD_1$	TOL H9	$Ød_1$	TOL js11	L_1 +0.010-0	SL	PART No.
6.000	+0.004 0.000	5.500	+0.005 -0.005	0.562	0.619	4393400
6.250	+0.004 0.000	5.750	+0.005 -0.005	0.563	0.619	4458300
6.500	+0.004 0.000	5.750	+0.005 -0.005	0.625	0.688	4743900
7.000	+0.004 0.000	6.250	+0.005 -0.005	0.375	0.413	4517700
7.000	+0.004 0.000	6.250	+0.005 -0.005	0.500	0.550	4445500
7.000	+0.004 0.000	6.250	+0.005 -0.005	0.625	0.688	4371400
7.000	+0.004 0.000	6.500	+0.005 -0.005	0.250	0.275	4517200
7.000	+0.004 0.000	6.500	+0.005 -0.005	0.375	0.413	4445400
8.000	+0.004 0.000	7.250	+0.006 -0.006	0.625	0.688	4371500
8.000	+0.004 0.000	7.500	+0.006 -0.006	0.250	0.275	4517300
9.000	+0.004 0.000	8.000	+0.006 -0.006	0.750	0.825	4371600
10.000	+0.005 0.000	9.000	+0.006 -0.006	0.750	0.825	4536200
10.000	+0.005 0.000	9.250	+0.006 -0.006	0.375	0.413	4575100



659

PISTON SEAL

*Single-Acting
Polyurethane, Twin Lip*

DESIGN

The Hallite 659 twin lip, asymmetric, single-acting piston seal with precision trimmed sealing lips provides a dry sealing solution in light and medium-duty application. The sealing lips are trimmed at an angle to give optimal rod sealing performance.

The Hallite 659 is designed to have an interference on the piston spigot diameter and has a secondary lip. The secondary sealing lip located behind the primary sealing lip improves stability of the seal in the piston. The outer dynamic lip is shorter and more robust to improving sealing and compression set characteristics over conventional, symmetrical U-rings.

The Hallite 659 is molded in Hythane® 181, Hallite's high-performance polyurethane, for easy installation and excellent low temperature performance. Depending on tube bore finish, the Hallite 659 is also offered in Hythane® 361 polyurethane.

This seal is for use in single-acting piston seal applications only.



FEATURES

- Robust design
- Excellent wear resistance
- Increase seal stability
- Performs well over wide temperature range and is extremely effective in low temperatures
- Primary lip protection
- Easy to install

MATERIALS

As standard, this product comes in the following material. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color
Standard	Hythane® 181	TPU-EU	Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-45°C +110°C	-50°F +230°F
Maximum Pressure	400 bar	6000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

MAXIMUM EXTRUSION GAP			
Pressure bar	160	250	400
Maximum Gap mm	0.60	0.50	0.40
Pressure psi	2400	3750	6000
Maximum Gap in	0.024	0.020	0.016

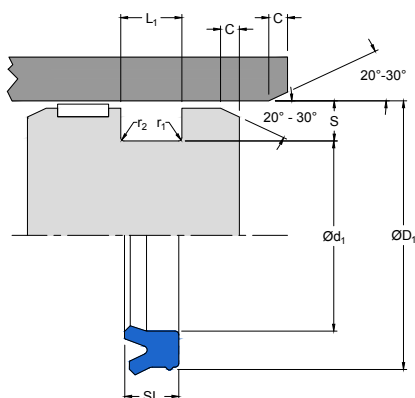
NOTE

Figures show the maximum permissible gap all on one side using minimum rod $\varnothing$ and maximum clearance $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing D_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing d_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII				
Groove Section $< S$ mm	4.00	5.00	7.50	10.00
Min Chamfer C mm	3.00	3.50	5.00	6.50
Max Fillet Rad r_1 mm	0.20	0.40	0.80	0.80
Max Fillet Rad r_2 mm	0.40	0.80	1.20	1.20
Groove Section $\leq S$ in	0.125	0.187	0.250	0.500
Min Chamfer C in	0.093	0.093	0.125	0.217
Max Fillet Rad r_1 in	0.008	0.008	0.016	0.032
Max Fillet Rad r_2 in	0.016	0.016	0.032	0.047

TOLERANCES	$\varnothing D_1$	$\varnothing d_1$	L_1
mm	H9	js11	+0.25 -0
in	+0.004 -0	0 -0.002	+0.010 -0



659

PISTON SEAL

*Single-Acting
Polyurethane, Twin Lip*

PART NUMBER RANGE

INCH				
ØD ₁ +0.004-0	Ød ₁ 0-0.002	SL	L ₁ +0.010-0	PART No.
1.250	1.000	0.171	0.187	4416600
1.500	1.250	0.187	0.207	4372400
1.750	1.250	0.375	0.413	4528600
2.000	1.630	0.250	0.281	4563300‡
2.375	1.750	0.437	0.481	4528500
2.500	2.130	0.250	0.281	4563400‡
3.000	2.250	0.500	0.550	4528400
3.000	2.618	0.375	0.413	4876000
3.000	2.630	0.250	0.281	4563500‡
3.500	3.130	0.250	0.281	4563600‡
3.625	2.875	0.562	0.619	4528300
4.000	3.630	0.250	0.281	4563700‡
4.250	3.500	0.562	0.619	4528200
5.000	4.000	0.731	0.804	4528100
6.000	5.000	0.731	0.804	4530200
7.000	6.000	0.731	0.804	4529700

NOTE

Part numbers suffixed by "‡" fit standard O-ring grooves.

PART NUMBERS ON THIS PAGE ARE LISTED IN THE STANDARD MATERIAL OPTION. FOR MATERIAL VARIATIONS OR FOR CUSTOM SIZES, MATERIALS, OR SEAL DESIGNS, PLEASE CONTACT YOUR LOCAL HALLITE REPRESENTATIVE.



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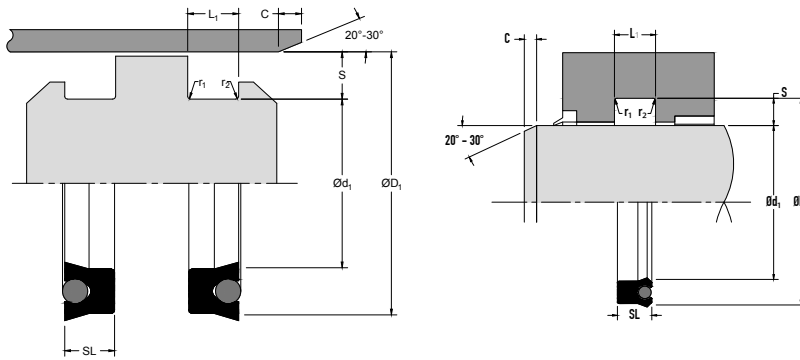


SINGLE-ACTING ROD AND PISTON SEALS

500

ROD/PISTON SEAL

SERIES 511, 512, and 513



GENERAL

The Hallite 500 series is a family of high performance loaded 'U' cups designed to interchange in standard North American housings. Since the launch in 1988, these seals have become accepted as the leading alternative choice for quality and cost effectiveness.

Hallite offers three profiles of single-acting seals in the 500 Series -- 511, 512, 513 -- which cover most applications from mobile hydraulics to industrial cylinders. The 511, 512, 513 are well proven in the field and are standard fitment for many of the leading cylinder and OEM manufacturers worldwide.

Each single product's data sheet outlines the operating condition parameters to give optimum performance and life for that profile. For applications outside, or at the extreme, of these figures, it is recommended that guidance is sought from Hallite technical teams

MATERIAL

All Hallite materials are subject to stringent quality controls to ensure consistency both in the manufacture and in use. The 500 series are manufactured, as a standard, polyurethane and fitted with a NBR O-ring. Other materials are available for combatting the effects of temperature extremes or fluid variations.

MEDIA

All seals are suitable for mineral-based hydraulic fluids. As the type of fluid can have enormous consequences for the life and performance, particularly at higher temperatures, it is advised that guidance is sought if non-standard fluid is used.

EXTRUSION GAPS

Extrusion gaps can be minimized by the use of glands or pistons with integral bearings. However, better bearing performance is often achieved by the use of remote bearings, which inevitably means that the extrusion gap is increased to achieve adequate metal-to-metal clearance. Please refer to individual data sheets for more information.

For this reason, guidance should be sought from the Hallite technical department if remote bearings are to be used with seals under 1/4" cross section.

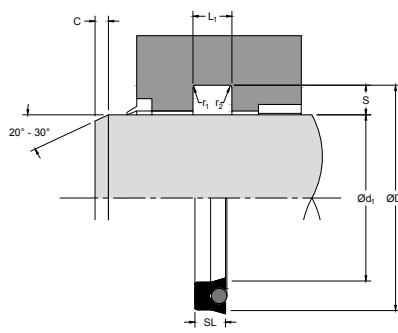
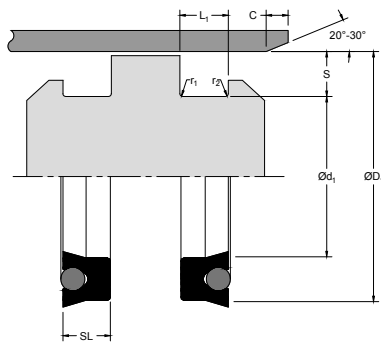
500 SERIES (INCH) - SPECIFIED TOLERANCES FOR PISTON APPLICATIONS

Seal Cross Section S	Bore Tolerance ØD ₁	Piston Spigot Tolerance Ød ₁	Groove Width Tolerance ØD ₁
1/8" (0.125)	+0.002 -0.000	+0.000 -0.002	+0.015 -0.000
3/16" (0.187)	+0.002 -0.000	+0.000 -0.002	+0.015 -0.000
1/4" (0.250)	+0.003 -0.000	+0.000 -0.003	+0.015 -0.000
5/16" (0.312)	+0.003 -0.000	+0.000 -0.004	+0.015 -0.000
3/8" (0.375)	+0.003 -0.000	+0.000 -0.005	+0.015 -0.000
1/2" (0.500)	+0.004 -0.000	+0.000 -0.007	+0.015 -0.000

500 SERIES (INCH) - SPECIFIED TOLERANCES FOR ROD APPLICATIONS

Seal Cross Section S	Bore Tolerance ØD ₁	Piston Spigot Tolerance Ød ₁	Groove Width Tolerance ØD ₁
1/8" (0.125)	+0.000 -0.001	+0.002 -0.000	+0.015 -0.000
3/16" (0.187)	+0.000 -0.002	+0.002 -0.000	+0.015 -0.000
1/4" (0.250)	+0.000 -0.002	+0.003 -0.000	+0.015 -0.000
5/16" (0.312)	+0.000 -0.002	+0.004 -0.000	+0.015 -0.000
3/8" (0.375)	+0.000 -0.002	+0.005 -0.000	+0.015 -0.000
1/2" (0.500)	+0.000 -0.003	+0.007 -0.000	+0.015 -0.000





511

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

DESIGN

The Hallite 511 is a standard profile loaded U-cup with precision trimmed sealing lips manufactured in either a polyurethane or polyester shell energised by a high quality O-ring and designed for common North American square grooves.

At zero or low pressure, the O-ring helps to increase the sealing force preventing any bypass. Under most conditions as the pressure rises, the sealing force increases and the O-ring ensures complete lip actuation.

The symmetry of the Hallite 511 makes it ideally suited for single-acting rod and piston applications and its flexibility enables easy installation. The 511 can also be fitted back-to-back for use in double-acting applications. Although the Hallite 511 can be used as a rod seal, other Hallite non-square rod seals are more suitable options, such as the Hallite 513, 605, or 621.



FEATURES

- Excellent resistance to abrasion
- Precision trimmed lips
- Positive lip actuation
- Easy to install

MATERIALS

This product comes in a number of material options to extend operating conditions. Contact your local Hallite technical team to decide which is best for your application. Use the part designator in the table below as the last digit of the part number to specify material choice when ordering. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Seal Type	Seal Color	Part Designator
Standard	Hythane® 221-NBR	TPU-EU	Black	10
Optional	TPE 121-NBR	TPE	Orange	11
Optional	TPE 121-FKM	TPE	Orange	12
Optional	Hythane® 361-NBR	TPU-AU	Orange	16



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	0.5 m/sec	1.5 ft/sec
Temperature Range	-40°C +110°C	-40°F +230°F
Maximum Pressure	350 bar	5000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

MAXIMUM EXTRUSION GAP - 1/4 SECTION AND ABOVE			
Pressure bar	160	250	350
Maximum Gap mm	0.60	0.50	0.40
Pressure psi	2400	3750	6000
Maximum Gap in	0.024	0.020	0.016

NOTE

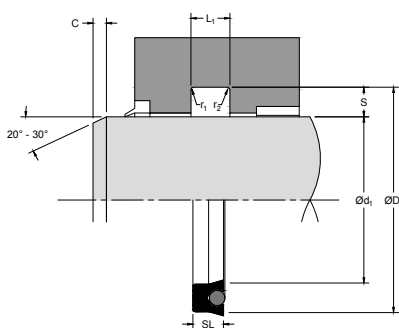
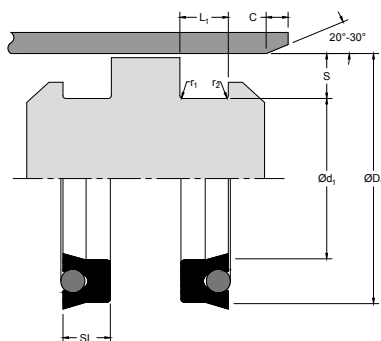
Figures show the maximum permissible gap all on one side using minimum rod $\varnothing$ and maximum clearance $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face Rod - $\varnothing d_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face Rod - $\varnothing d_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Dynamic Sealing Face Piston - $\varnothing d_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face Piston - $\varnothing d_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

RADII							
Groove Section $\leq S$ in	0.125	0.187	0.250	0.312	0.375	0.500	0.625
Min Chamfer C in	0.093	0.093	0.125	0.156	0.187	0.187	0.217
Max Fillet Rad r_1 in	0.008	0.008	0.016	0.032	0.032	0.032	0.047
Max Fillet Rad r_2 in	0.016	0.016	0.032	0.047	0.047	0.047	0.062

NOTE

Please refer to specified tolerances in the introduction page of the Hallite 500 Series.



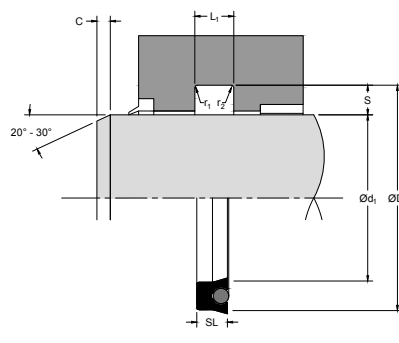
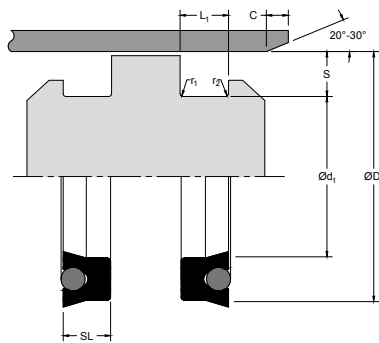
511

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

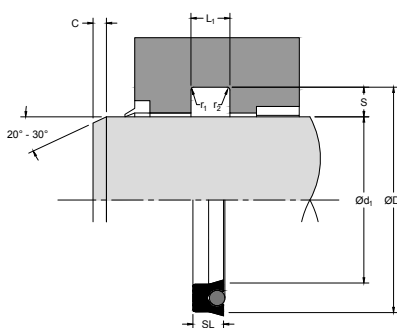
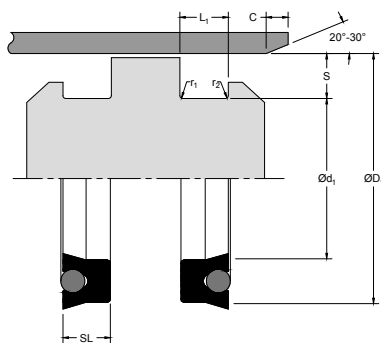
PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	STANDARD REFERENCE	PART No.
1/8 CROSS SECTION					
0.063	0.313	0.125	0.138	12500063	8920810
0.125	0.375	0.125	0.138	12500125	8900810
0.188	0.438	0.125	0.138	12500188	8800110
0.250	0.500	0.125	0.138	12500250	8800210
0.313	0.563	0.125	0.138	12500313	8902810
0.375	0.625	0.125	0.138	12500375	8800410
0.438	0.688	0.125	0.138	12500438	8905110
0.500	0.750	0.125	0.138	12500500	8800610
0.563	0.813	0.125	0.138	12500563	8844610
0.625	0.875	0.125	0.138	12500625	8800810
0.688	0.938	0.125	0.138	12500688	8801010
0.750	1.000	0.125	0.138	12500750	8801110
0.813	1.063	0.125	0.138	12500813	8815310
0.875	1.125	0.125	0.138	12500875	8801410
0.938	1.188	0.125	0.138	12500938	8844810
1.000	1.250	0.125	0.138	12501000	8801610
1.063	1.313	0.125	0.138	12501063	8801810
1.125	1.375	0.125	0.138	12501125	8801910
1.188	1.438	0.125	0.138	12501188	8921310
1.250	1.500	0.125	0.138	12501250	8802210
1.375	1.625	0.125	0.138	12501375	8802410
1.500	1.750	0.125	0.138	12501500	8802610
1.625	1.875	0.125	0.138	12501625	8802810
1.750	2.000	0.125	0.138	12501750	8803010
1.875	2.125	0.125	0.138	12501875	8803210
2.000	2.250	0.125	0.138	12502000	8803410
2.250	2.500	0.125	0.138	12502250	8803810
2.375	2.625	0.125	0.138	12502375	8815610
2.500	2.750	0.125	0.138	12502500	8800310
2.750	3.000	0.125	0.138	12502750	8817910
2.875	3.125	0.125	0.138	12502875	8814210



PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	STANDARD REFERENCE	PART No.
3.000	3.250	0.125	0.138	12503000	8804510
3.250	3.500	0.125	0.138	12503250	8819610
3.500	3.750	0.125	0.138	12503500	8815810
3.750	4.000	0.125	0.138	12503750	8818710
3.875	4.125	0.125	0.138	12503875	8816510
4.000	4.250	0.125	0.138	12504000	8805210
4.250	4.500	0.125	0.138	12504250	8819710
4.750	5.000	0.125	0.138	12504750	8818110
4.875	5.125	0.125	0.138	12504875	8816710
5/32 CROSS SECTION					
1.000	1.313	0.156	0.172	15651000	8810110
1.187	1.500	0.156	0.172	15651187	8811010
1.250	1.563	0.156	0.172	15651250	8813810
1.375	1.688	0.156	0.172	15651375	8813910
3/16 CROSS SECTION					
0.375	0.750	0.188	0.207	18750375	8902910
0.500	0.875	0.188	0.207	18750500	8800710
0.563	0.938	0.188	0.207	18750563	8932810
0.625	1.000	0.188	0.207	18750625	8800910
0.750	1.125	0.188	0.207	18750750	8801210
0.875	1.250	0.188	0.207	18750875	8801510
1.000	1.375	0.188	0.207	18751000	8801710
1.125	1.500	0.188	0.207	18751125	8802010
1.188	1.563	0.188	0.207	18751188	8851710
1.250	1.625	0.188	0.207	18751250	8802310
1.375	1.750	0.188	0.207	18751375	8802510
1.500	1.875	0.188	0.207	18751500	8802710
1.625	2.000	0.188	0.207	18751625	8802910
1.750	2.125	0.188	0.207	18751750	8803110
1.875	2.250	0.188	0.207	18751875	8803310
2.000	2.375	0.188	0.207	18752000	8803510
2.125	2.500	0.188	0.207	18752125	8803710



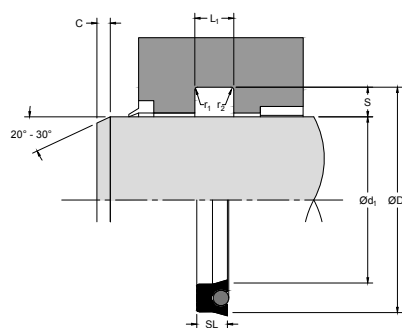
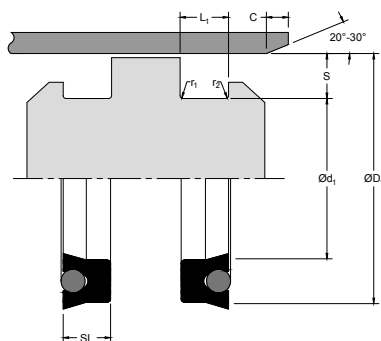
511

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

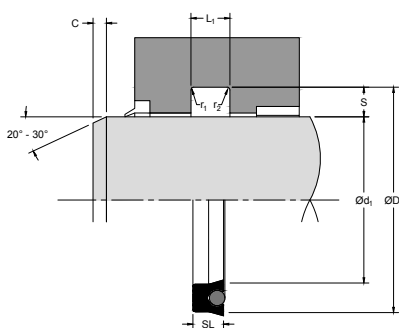
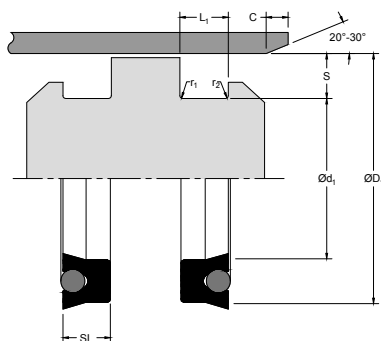
PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	STANDARD REFERENCE	PART No.
2.250	2.625	0.188	0.207	18752250	8803910
2.375	2.750	0.188	0.207	18752375	8804010
2.500	2.875	0.188	0.207	18752500	8804110
2.625	3.000	0.188	0.207	18752625	8804210
2.750	3.125	0.188	0.207	18752750	8804410
2.875	3.250	0.188	0.207	18752875	8851010
3.000	3.375	0.188	0.207	18753000	8804610
3.125	3.500	0.188	0.207	18753125	8804710
3.250	3.625	0.188	0.207	18753250	8804810
3.375	3.750	0.188	0.207	18753375	8854210
3.500	3.875	0.188	0.207	18753500	8805010
3.625	4.000	0.188	0.207	18753625	8805110
3.750	4.125	0.188	0.207	18753750	8879410
3.875	4.250	0.188	0.207	18753875	8823510
4.000	4.375	0.188	0.207	18754000	8805310
4.125	4.500	0.188	0.207	18754125	8805410
4.250	4.625	0.188	0.207	18754250	8805510
4.375	4.750	0.188	0.207	18754375	8854310
4.500	4.875	0.188	0.207	18754500	8805710
4.625	5.000	0.188	0.207	18754625	8879510
4.875	5.250	0.188	0.207	18754875	8823610
5.125	5.500	0.188	0.207	18755125	8908510
7/32 CROSS SECTION					
2.500	2.937	0.218	0.240	21852500	8921410
2.563	3.000	0.218	0.240	21852563	8921510
1/4 CROSS SECTION					
0.313	0.813	0.250	0.275	25000313	8824710
0.375	0.875	0.250	0.275	25000375	8865810
0.500	1.000	0.250	0.275	25000500	8806310
0.625	1.125	0.250	0.275	25000625	8806410
0.750	1.250	0.250	0.275	25000750	8806510
0.875	1.375	0.250	0.275	25000875	8806610



PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	STANDARD REFERENCE	PART No.
0.938	1.438	0.250	0.275	25000938	8921010
1.000	1.500	0.250	0.275	25001000	8806810
1.125	1.625	0.250	0.275	25001125	8807010
1.188	1.688	0.250	0.275	25001188	8921210
1.250	1.750	0.250	0.275	25001250	8807210
1.375	1.875	0.250	0.275	25001375	8807310
1.500	2.000	0.203	0.223	25001500	8801310
1.500	2.000	0.250	0.275	25001500	8807510
1.625	2.125	0.250	0.275	25001625	8807710
1.750	2.250	0.250	0.275	25001750	8807810
1.875	2.375	0.250	0.275	25001875	8808010
2.000	2.500	0.250	0.275	25002000	8808210
2.125	2.625	0.250	0.275	25002125	8808410
2.250	2.750	0.250	0.275	25002250	8808610
2.375	2.875	0.250	0.275	25002375	8808810
2.500	3.000	0.203	0.223	25002500	8803610
2.500	3.000	0.250	0.275	25002500	8809010
2.625	3.125	0.250	0.275	25002625	8809110
2.750	3.250	0.250	0.275	25002750	8809210
2.875	3.375	0.250	0.275	25002875	8809410
3.000	3.500	0.203	0.223	25003000	8816110
3.000	3.500	0.250	0.275	25003000	8809610
3.250	3.750	0.250	0.275	25003250	8810010
3.375	3.875	0.250	0.275	25003375	8850710
3.500	4.000	0.203	0.223	25003500	8817210
3.500	4.000	0.250	0.275	25003500	8810310
3.625	4.125	0.250	0.275	25003625	8810510
3.750	4.250	0.250	0.275	25003750	8810610
3.875	4.375	0.250	0.275	25003875	8810710
4.000	4.500	0.250	0.275	25004000	8810810
4.250	4.750	0.250	0.275	25004250	8811210
4.375	4.875	0.250	0.275	25004375	8811410



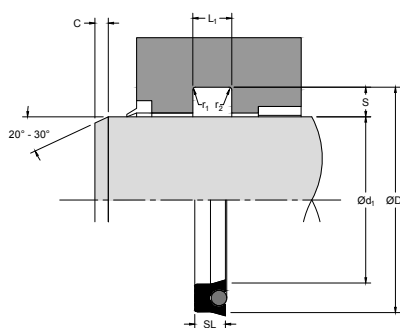
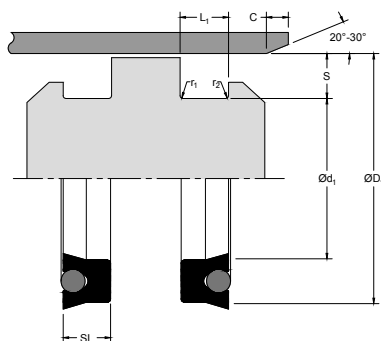
511

ROD/PISTON SEAL

Single-Acting
TPU/TPE with O-Ring Energizer

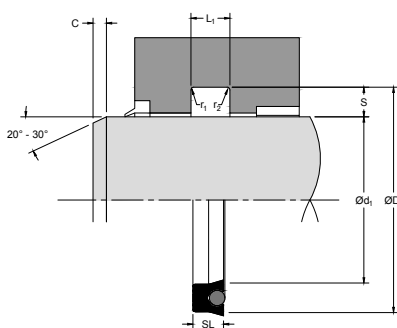
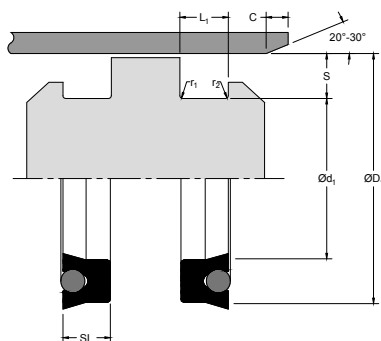
PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	STANDARD REFERENCE	PART No.
4.500	5.000	0.203	0.223	25004500	8804310
4.500	5.000	0.250	0.275	25004500	8811610
4.625	5.125	0.250	0.275	25004625	8811810
4.750	5.250	0.250	0.275	25004750	8811910
4.875	5.375	0.250	0.275	25004875	8856510
5.000	5.500	0.250	0.275	25005000	8812010
5.250	5.750	0.250	0.275	25005250	8812210
5.500	6.000	0.250	0.275	25005500	8812410
5.750	6.250	0.250	0.275	25005750	8812610
6.000	6.500	0.250	0.275	25006000	8812810
6.250	6.750	0.250	0.275	25006250	8856610
6.500	7.000	0.250	0.275	25006500	8813110
6.750	7.250	0.250	0.275	25006750	8813210
7.000	7.500	0.250	0.275	25007000	8813310
7.250	7.750	0.250	0.275	25007250	8856710
7.500	8.000	0.250	0.275	25007500	8813410
7.750	8.250	0.250	0.275	25007750	8921810
8.000	8.500	0.250	0.275	25008000	8813610
8.250	8.750	0.250	0.275	25008250	8856810
8.500	9.000	0.250	0.275	25008500	8813710
11.500	12.000	0.250	0.275	25011500	8922210
9/32 CROSS SECTION					
5.437	6.000	0.281	0.310	28155437	8921710
5/16 CROSS SECTION					
0.250	0.875	0.312	0.344	31250250	8899710
0.375	1.000	0.313	0.344	31250375	8824910
0.688	1.313	0.312	0.344	31250688	8906710
0.875	1.500	0.313	0.344	31250875	8920910
1.000	1.625	0.313	0.344	31251000	8806910
1.125	1.750	0.313	0.344	31251125	8807110
1.188	1.813	0.313	0.344	31251188	8933010
1.250	1.875	0.313	0.344	31251250	8870010



PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	STANDARD REFERENCE	PART No.
1.375	2.000	0.313	0.344	31251375	8807410
1.500	2.125	0.313	0.344	31251500	8807610
1.625	2.250	0.313	0.344	31251625	8850910
1.750	2.375	0.313	0.344	31251750	8807910
1.875	2.500	0.313	0.344	31251875	8808110
2.000	2.625	0.313	0.344	31252000	8808310
2.125	2.750	0.313	0.344	31252125	8808510
2.250	2.875	0.313	0.344	31252250	8808710
2.375	3.000	0.313	0.344	31252375	8808910
2.500	3.125	0.313	0.344	31252500	8870110
2.625	3.250	0.313	0.344	31252625	8851110
2.750	3.375	0.313	0.344	31252750	8809310
2.875	3.500	0.313	0.344	31252875	8809510
3.000	3.625	0.313	0.344	31253000	8809710
3.125	3.750	0.313	0.344	31253125	8809910
3.250	3.875	0.313	0.344	31253250	8879610
3.375	4.000	0.313	0.344	31253375	8810210
3.500	4.125	0.313	0.344	31253500	8810410
3.550	4.175	0.250	0.275	31253550	8899510
3.625	4.250	0.313	0.344	31253625	8851210
3.750	4.375	0.313	0.344	31253750	8870210
3.875	4.500	0.313	0.344	31253875	8870310
4.000	4.625	0.313	0.344	31254000	8810910
4.125	4.750	0.313	0.344	31254125	8811110
4.250	4.875	0.313	0.344	31254250	8811310
4.375	5.000	0.313	0.344	31254375	8811510
4.500	5.125	0.313	0.344	31254500	8811710
4.750	5.375	0.313	0.344	31254750	8879710
4.875	5.500	0.313	0.343	31254875	8921610
5.000	5.625	0.313	0.344	31255000	8812110
5.250	5.875	0.313	0.344	31255250	8856910
5.375	6.000	0.313	0.344	31255375	8812310



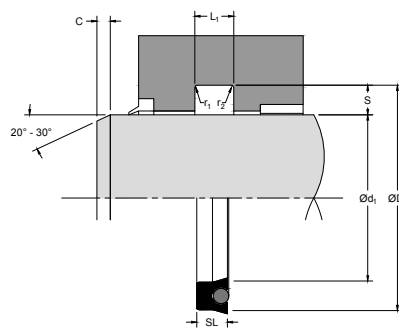
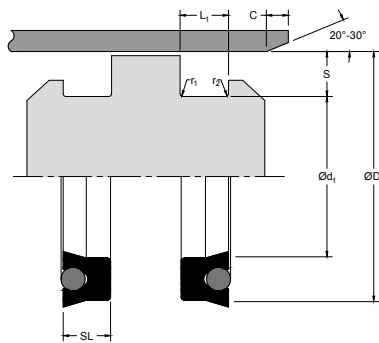
511

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

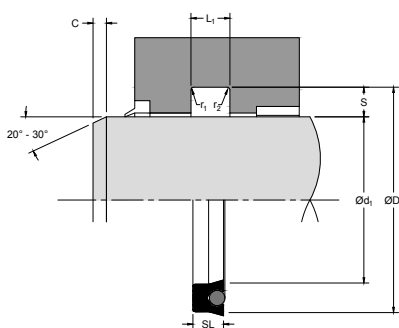
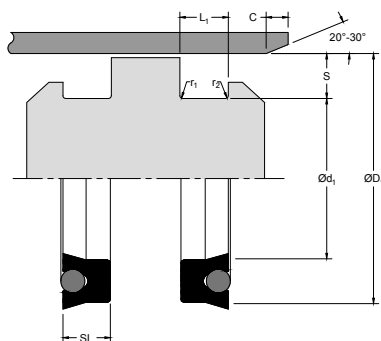
PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	STANDARD REFERENCE	PART No.
5.500	6.125	0.313	0.344	31255500	8812510
5.750	6.375	0.313	0.344	31255750	8857010
6.000	6.625	0.313	0.344	31256000	8812910
6.250	6.875	0.313	0.344	31256250	8857110
6.375	7.000	0.313	0.344	31256375	8813010
6.500	7.125	0.313	0.344	31256500	8876610
6.750	7.375	0.313	0.344	31256750	8857210
7.000	7.625	0.313	0.344	31257000	8879310
7.250	7.875	0.313	0.344	31257250	8857310
7.375	8.000	0.313	0.344	31257375	8876710
7.500	8.125	0.313	0.344	31257500	8813510
7.750	8.375	0.313	0.344	31257750	8857410
8.000	8.625	0.313	0.344	31258000	8876910
8.250	8.875	0.313	0.344	31258250	8857510
8.500	9.125	0.313	0.344	31258500	8857610
3/8 CROSS SECTION					
0.875	1.625	0.375	0.413	37500875	8933210
1.000	1.750	0.375	0.413	37501000	8819110
1.125	1.875	0.375	0.413	37501125	8921110
1.250	2.000	0.375	0.413	37501250	8814310
1.375	2.125	0.375	0.413	37501375	8814410
1.500	2.250	0.375	0.413	37501500	8814510
1.625	2.375	0.375	0.413	37501625	8814710
1.750	2.500	0.375	0.413	37501750	8814810
2.000	2.750	0.375	0.413	37502000	8814910
2.125	2.875	0.375	0.413	37502125	8815110
2.250	3.000	0.375	0.413	37502250	8869910
2.500	3.250	0.375	0.413	37502500	8815410
2.750	3.500	0.375	0.413	37502750	8815710
3.000	3.750	0.375	0.413	37503000	8815910
3.250	4.000	0.375	0.413	37503250	8816210
3.375	4.125	0.375	0.413	37503375	8857710



PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	STANDARD REFERENCE	PART No.
3.500	4.250	0.375	0.413	37503500	8816410
3.625	4.375	0.375	0.413	37503625	8824610
3.750	4.500	0.375	0.413	37503750	8816610
3.875	4.625	0.375	0.413	37503875	8819210
4.000	4.750	0.375	0.413	37504000	8816810
4.125	4.875	0.375	0.413	37504125	8853210
4.250	5.000	0.375	0.413	37504250	8817010
4.500	5.250	0.375	0.413	37504500	8817310
4.750	5.500	0.375	0.413	37504750	8817510
5.000	5.750	0.375	0.413	37505000	8817610
5.250	6.000	0.375	0.413	37505250	8817810
5.500	6.250	0.375	0.413	37505500	8818010
5.625	6.375	0.375	0.413	37505625	8814110
5.750	6.500	0.375	0.413	37505750	8818210
6.000	6.750	0.375	0.413	37506000	8818310
6.250	7.000	0.375	0.413	37506250	8818510
6.500	7.250	0.375	0.413	37506500	8818610
6.750	7.500	0.375	0.413	37506750	8818810
7.000	7.750	0.375	0.413	37507000	8877010
7.250	8.000	0.375	0.413	37507250	8818910
7.500	8.250	0.375	0.413	37507500	8877110
7.625	8.375	0.375	0.413	37507625	8814010
7.750	8.500	0.375	0.413	37507750	8853910
8.000	8.750	0.375	0.413	37508000	8869210
8.250	9.000	0.375	0.413	37508250	8851410
8.750	9.500	0.375	0.413	37508750	8921910
10.000	10.750	0.375	0.413	37510000	8922010
11.000	11.750	0.375	0.413	37511000	8922110
1/2 CROSS SECTION					
1.500	2.500	0.500	0.550	50001500	8814610
1.875	2.875	0.500	0.550	50001875	8825510
2.000	3.000	0.500	0.550	50002000	8815010



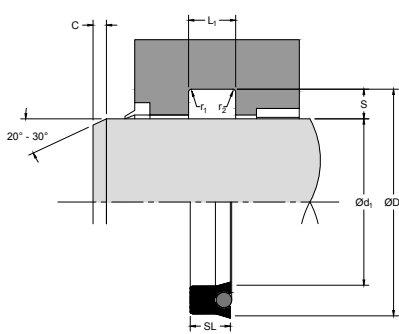
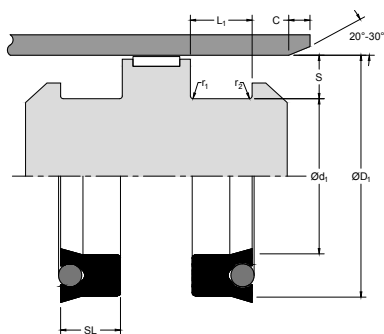
511

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	STANDARD REFERENCE	PART No.
2.125	3.125	0.500	0.550	50002125	8853110
2.500	3.500	0.500	0.550	50002500	8815510
2.750	3.750	0.500	0.550	50002750	8900010
3.000	4.000	0.500	0.550	50003000	8816010
3.375	4.375	0.500	0.550	50003375	8866910
4.000	5.000	0.500	0.550	50004000	8816910
4.250	5.250	0.500	0.550	50004250	8858910
4.500	5.500	0.500	0.550	50004500	8817410
5.000	6.000	0.500	0.550	50005000	8817710
5.125	6.125	0.500	0.550	50005125	8851810
5.250	6.250	0.500	0.550	50005250	8900110
5.375	6.375	0.500	0.550	50005375	8863610
6.000	7.000	0.500	0.550	50006000	8818410
6.250	7.250	0.500	0.550	50006250	8857810
6.500	7.500	0.500	0.550	50006500	8815210
7.000	8.000	0.500	0.550	50007000	8851310
7.250	8.250	0.500	0.550	50007250	8857910
7.375	8.375	0.500	0.550	50007375	8863910
7.500	8.500	0.500	0.550	50007500	8851610
8.000	9.000	0.500	0.550	50008000	8819010
8.125	9.125	0.500	0.550	50008125	8853810
9.000	10.000	0.500	0.550	50009000	8905410
5/8 CROSS SECTION					
2.750	4.000	0.625	0.688	62502750	8819310
3.250	4.500	0.625	0.688	62503250	8822410
4.250	5.500	0.625	0.688	62504250	8819810
4.750	6.000	0.625	0.688	62504750	8819410
6.500	7.750	0.625	0.688	62506500	8819910
6.750	8.000	0.625	0.688	62506750	8819510



512

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

DESIGN

The Hallite 512 is a standard profile loaded U-cup with precision trimmed sealing lips manufactured in either a polyurethane or polyester shell energised by a high quality O-ring and designed for common North American grooves. The precision trimmed sealing lips ensure optimum sealing action. The deep profile of the Hallite 512 provides extra stability needed to resist rolling in the groove. Together these features result in improved life and sealing.

At zero or low pressure, the O-ring helps to increase the sealing force preventing any bypass. Under most conditions as the pressure rises, the sealing force increases and the O-ring ensures complete lip actuation.

The symmetry of the Hallite 512 makes it ideally suited for single-acting rod and piston applications and its flexibility enables easy installation. The Hallite 512 can also be fitted back-to-back for use in double-acting applications. Although the Hallite 512 can be used as a rod seal, other Hallite profiles are more suitable options, such as the Hallite 513, 605, or 621.



FEATURES

- Excellent resistance to abrasion
- Deep profile for stability
- Positive lip actuation
- Easy to install
- Precision trimmed lips

MATERIALS

This product comes in a number of material options to extend operating conditions. Contact your local Hallite technical team to decide which is best for your application. Use the part designator in the table below as the last digit of the part number to specify material choice when ordering. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Seal Type	Seal Color	Part Designator
Standard	Hythane® 221-NBR	TPU-EU	Black	10
Optional	TPE 121-NBR	TPE	Orange	11
Optional	TPE 121-FKM	TPE	Orange	12
Optional	Hythane® 361-NBR	TPU-AU	Orange	16



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	0.5 m/sec	1.5 ft/sec
Temperature Range	-40°C +110°C	-40°F +230°F
Maximum Pressure	350 bar	5000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

MAXIMUM EXTRUSION GAP - 1/4 SECTION AND ABOVE			
Pressure bar	160	250	350
Maximum Gap mm	0.60	0.50	0.40
Pressure psi	2400	3750	6000
Maximum Gap in	0.024	0.020	0.016

NOTE

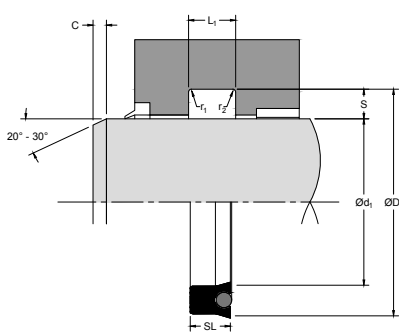
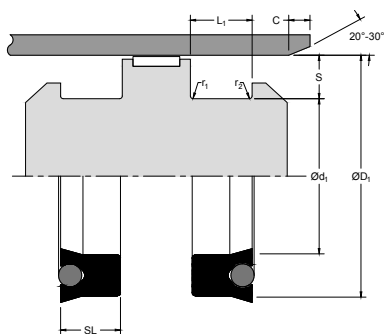
Figures show the maximum permissible gap all on one side, for rod seals using minimum rod $\varnothing$ and maximum clearance $\varnothing$ and for piston seals using the minimum clearance $\varnothing$ and maximum bore $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing d_1$ - Rod	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing D_1$ - Rod	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Dynamic Sealing Face $\varnothing D_1$ - Piston	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing d_1$ - Piston	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

RADII						
Groove Section $\leq S$ in	0.125	0.187	0.250	0.312	0.375	0.500
Min Chamfer C in	0.093	0.093	0.125	0.156	0.187	0.187
Max Fillet Rad r_1 in	0.008	0.008	0.016	0.032	0.032	0.032
Max Fillet Rad r_2 in	0.016	0.016	0.032	0.047	0.047	0.047

NOTE

Please refer to specified tolerances in the introduction page of the Hallite 500 Series.



512

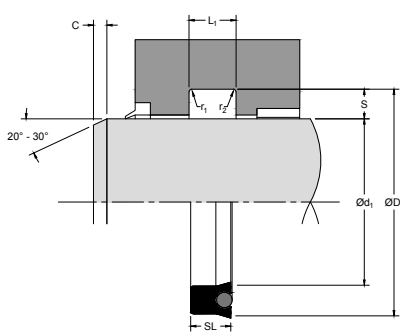
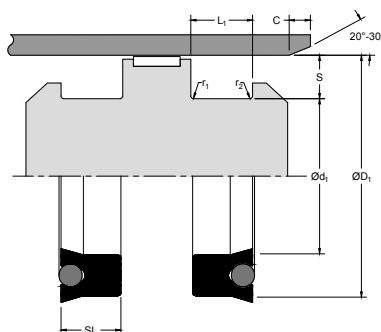
ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

PART NUMBER RANGE

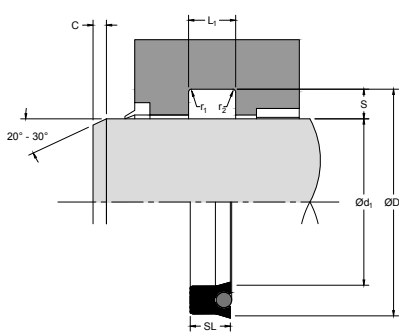
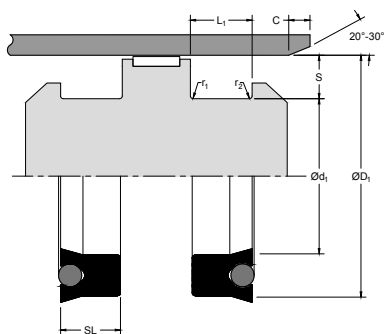
INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
1/8 CROSS SECTION					
0.250	0.500	0.250	0.275	12500250-250	8820210
0.500	0.750	0.250	0.275	12500500-250	8870510
0.625	0.875	0.250	0.275	12500625-250	8820510
0.750	1.000	0.250	0.275	12500750-250	8820710
1.000	1.250	0.250	0.275	12501000-250	8821210
1.125	1.375	0.250	0.275	12501125-250	8854910
1.188	1.438	0.188	0.207	12501188-188	8858010
1.250	1.500	0.250	0.275	12501250-250	8821810
1.375	1.625	0.250	0.275	12501375-250	8822110
1.500	1.750	0.250	0.275	12501500-250	8822310
1.625	1.875	0.250	0.275	12501625-250	8870610
1.750	2.000	0.250	0.275	12501750-250	8822810
2.000	2.250	0.250	0.275	12502000-250	8823110
3/16 CROSS SECTION					
0.750	1.125	0.313	0.344	18700750-313	8820810
0.875	1.250	0.375	0.413	18700875-375	8933110
1.000	1.375	0.313	0.344	18701000-313	8821310
1.125	1.500	0.250	0.275	18701125-250	8820610
1.125	1.500	0.313	0.344	18701125-313	8821710
1.250	1.625	0.313	0.344	18701250-313	8821910
1.375	1.750	0.313	0.344	18701375-313	8822210
1.375	1.750	0.375	0.413	18701375-375	8870710
1.500	1.875	0.375	0.413	18701500-375	8822510
1.625	2.000	0.250	0.275	18701625-250	8908210
1.625	2.000	0.313	0.344	18701625-313	8858110
1.625	2.000	0.375	0.413	18701625-375	8822710
1.750	2.125	0.375	0.413	18701750-375	8822910
1.875	2.250	0.375	0.413	18701875-375	8870810
2.000	2.375	0.375	0.413	18702000-375	8823210
2.125	2.500	0.250	0.275	18702125-250	8865510
2.125	2.500	0.375	0.413	18702125-375	8870910





PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
2.188	2.563	0.375	0.413	18702188-375	8858210
2.250	2.625	0.313	0.344	18702250-313	8858310
2.250	2.625	0.375	0.413	18702250-375	8823410
2.375	2.750	0.375	0.413	18702375-375	8858410
2.500	2.875	0.375	0.413	18702500-375	8871010
2.625	3.000	0.313	0.344	18702625-313	8858510
2.625	3.000	0.375	0.413	18702625-375	8823710
2.750	3.125	0.375	0.413	18702750-375	8871110
2.875	3.250	0.250	0.275	18702875-250	8865610
3.000	3.375	0.375	0.413	18703000-375	8823910
3.125	3.500	0.250	0.275	18703125-250	8867310
3.125	3.500	0.375	0.413	18703125-375	8871210
3.188	3.563	0.375	0.413	18703188-375	8858610
3.250	3.625	0.313	0.344	18703250-313	8858710
3.250	3.625	0.375	0.413	18703250-375	8824010
3.375	3.750	0.375	0.413	18703375-375	8858810
3.500	3.875	0.375	0.413	18703500-375	8824110
3.625	4.000	0.313	0.344	18703625-313	8864010
3.625	4.000	0.375	0.413	18703625-375	8824210
3.750	4.125	0.375	0.413	18703750-375	8855010
3.875	4.250	0.250	0.275	18703875-250	8820910
4.000	4.375	0.375	0.413	18704000-375	8824310
4.125	4.500	0.313	0.344	18704125-313	8867210
4.125	4.500	0.375	0.413	18704125-375	8871310
4.188	4.563	0.375	0.413	18704188-375	8859010
4.250	4.625	0.313	0.344	18704250-313	8859110
4.250	4.625	0.375	0.413	18704250-375	8824410
4.375	4.750	0.375	0.413	18704375-375	8859210
4.500	4.875	0.375	0.413	18704500-375	8824510
4.625	5.000	0.313	0.344	18704625-313	8859310
4.625	5.000	0.375	0.413	18704625-375	8855410
4.875	5.250	0.250	0.275	18704875-250	8821510



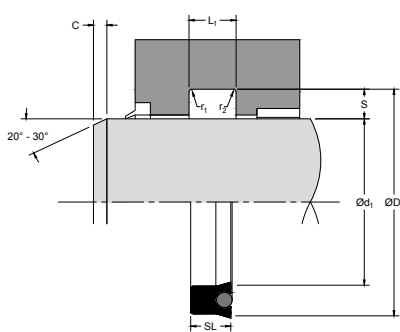
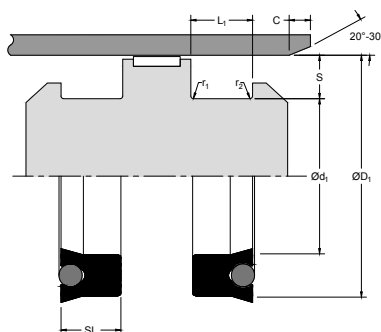
512

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

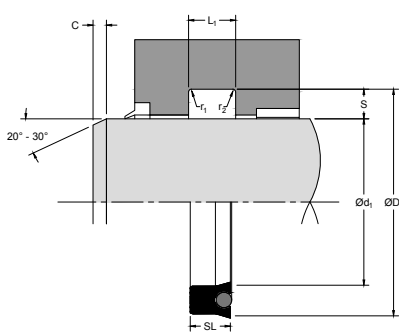
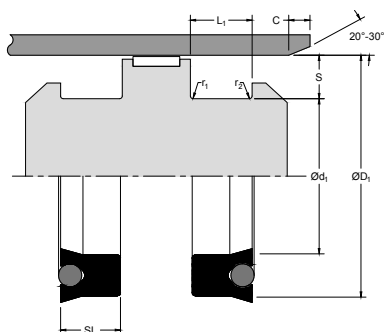
PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
1/4 CROSS SECTION					
0.500	1.000	0.375	0.413	25000500-375	8922310
0.688	1.188	0.375	0.413	25000688-375	8906110
0.750	1.250	0.375	0.413	25000750-375	8825010
0.875	1.375	0.313	0.344	25000875-313	8906810
1.000	1.500	0.313	0.344	25001000-313	8906910
1.000	1.500	0.375	0.413	25001000-375	8825210
1.000	1.500	0.437	0.480	25001000-437	8907210
1.125	1.625	0.375	0.413	25001125-375	8847610
1.250	1.750	0.375	0.413	25001250-375	8825410
1.375	1.875	0.375	0.413	25001375-375	8825610
1.500	2.000	0.313	0.344	25001500-313	8821010
1.500	2.000	0.375	0.413	25001500-375	8825710
1.750	2.250	0.375	0.413	25001750-375	8825910
2.000	2.500	0.375	0.413	25002000-375	8826210
2.125	2.625	0.375	0.413	25002125-375	8826410
2.250	2.750	0.375	0.413	25002250-375	8826510
2.250	2.750	0.563	0.619	25002250-563	8864110
2.375	2.875	0.375	0.413	25002375-375	8826610
2.500	3.000	0.313	0.344	25002500-313	8821110
2.500	3.000	0.375	0.413	25002500-375	8826810
2.750	3.250	0.375	0.413	25002750-375	8826910
3.000	3.500	0.375	0.413	25003000-375	8827010
3.000	3.500	0.563	0.619	25003000-563	8850610
3.125	3.625	0.375	0.413	25003125-375	8859510
3.250	3.750	0.375	0.413	25003250-375	8827310
3.500	4.000	0.313	0.344	25003500-313	8865710
3.500	4.000	0.375	0.413	25003500-375	8827510
3.750	4.250	0.375	0.413	25003750-375	8827810
4.000	4.500	0.375	0.413	25004000-375	8827910
4.000	4.500	0.563	0.619	25004000-563	8828010
4.125	4.625	0.375	0.413	25004125-375	8859610



PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
4.250	4.750	0.375	0.413	25004250-375	8828210
4.250	4.750	0.563	0.619	25004250-563	8833710
4.500	5.000	0.313	0.344	25004500-313	8821410
4.500	5.000	0.375	0.413	25004500-375	8828610
4.500	5.000	0.563	0.619	25004500-563	8828710
4.750	5.250	0.563	0.619	25004750-563	8933410
5.000	5.500	0.375	0.413	25005000-375	8871510
5.000	5.500	0.563	0.619	25005000-563	8828810
5.500	6.000	0.375	0.413	25005500-375	8829110
5.500	6.000	0.500	0.550	25005500-500	8922510
5.500	6.000	0.563	0.619	25005500-563	8829210
5.750	6.250	0.563	0.619	25005750-563	8905510
6.000	6.500	0.563	0.619	25006000-563	8829310
6.500	7.000	0.375	0.413	25006500-375	8829510
6.500	7.000	0.563	0.619	25006500-563	8829710
7.000	7.500	0.375	0.413	25007000-375	8822610
7.000	7.500	0.563	0.619	25007000-563	8877210
7.500	8.000	0.375	0.413	25007500-375	8829610
7.500	8.000	0.563	0.619	25007500-563	8877310
8.500	9.000	0.375	0.413	25008500-375	8829810
8.500	9.000	0.563	0.619	25008500-563	8855110
5/16 CROSS SECTION					
1.000	1.625	0.500	0.550	31201000-500	8825310
1.375	2.000	0.500	0.550	31201375-500	8871610
1.500	2.125	0.500	0.550	31201500-500	8825810
1.750	2.375	0.500	0.550	31201750-500	8826010
1.875	2.500	0.500	0.550	31201875-500	8826110
2.000	2.625	0.500	0.550	31202000-500	8826310
2.375	3.000	0.500	0.550	31202375-500	8826710
2.500	3.125	0.500	0.550	31202500-500	8871810
2.750	3.375	0.500	0.550	31202750-500	8871910
2.875	3.500	0.500	0.550	31202875-500	8872010



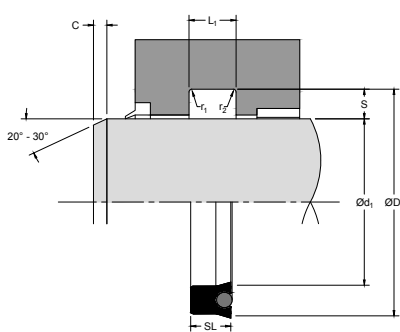
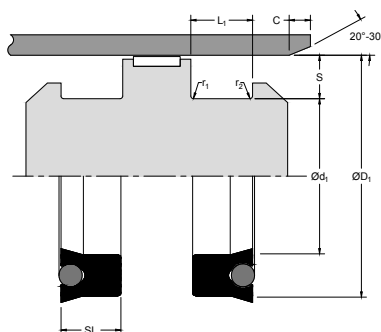
512

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

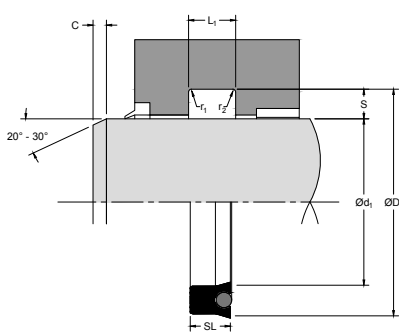
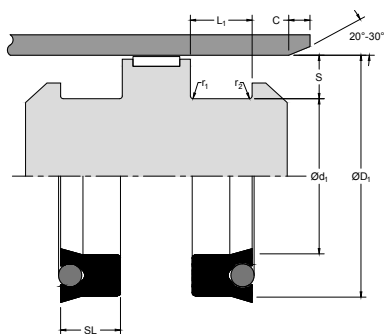
PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
3.000	3.625	0.500	0.550	31203000-500	8827110
3.375	4.000	0.500	0.550	31203375-500	8872110
3.500	4.125	0.500	0.550	31203500-500	8827710
3.750	4.375	0.500	0.550	31203750-500	8872210
3.875	4.500	0.500	0.550	31203875-500	8872310
4.375	5.000	0.500	0.550	31204375-500	8828410
4.375	5.000	0.563	0.619	31204375-563	8922410
4.375	5.000	0.625	0.688	31204375-625	8872410
4.500	5.125	0.625	0.688	31204500-625	8872510
5.375	6.000	0.625	0.688	31205375-625	8872610
6.375	7.000	0.625	0.688	31206375-625	8829410
7.000	7.625	0.625	0.688	31207000-625	8859710
7.375	8.000	0.625	0.688	31207375-625	8855310
3/8 CROSS SECTION					
1.500	2.250	0.500	0.550	37501500-500	8872710
1.500	2.250	0.625	0.688	37501500-625	8872810
1.750	2.500	0.500	0.550	37501750-500	8830010
2.000	2.750	0.500	0.550	37502000-500	8830310
2.000	2.750	0.625	0.688	37502000-625	8830410
2.250	3.000	0.500	0.550	37502250-500	8872910
2.250	3.000	0.625	0.688	37502250-625	8873010
2.500	3.250	0.500	0.550	37502500-500	8879210
2.500	3.250	0.625	0.688	37502500-625	8830510
2.750	3.500	0.500	0.550	37502750-500	8830710
2.750	3.500	0.625	0.688	37502750-625	8830810
3.000	3.750	0.500	0.550	37503000-500	8831010
3.000	3.750	0.625	0.688	37503000-625	8878710
3.250	4.000	0.500	0.550	37503250-500	8831110
3.250	4.000	0.625	0.688	37503250-625	8831210
3.375	4.125	0.625	0.688	37503375-625	8855910
3.500	4.250	0.500	0.550	37503500-500	8878810
3.500	4.250	0.625	0.688	37503500-625	8831310



PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
3.750	4.500	0.500	0.550	37503750-500	8831410
4.000	4.750	0.500	0.550	37504000-500	8878910
4.000	4.750	0.625	0.688	37504000-625	8831610
4.250	5.000	0.500	0.550	37504250-500	8831810
4.250	5.000	0.625	0.688	37504250-625	8831910
4.500	5.250	0.500	0.550	37504500-500	8832010
4.500	5.250	0.625	0.688	37504500-625	8832110
4.750	5.500	0.625	0.688	37504750-625	8832210
5.000	5.750	0.500	0.550	37505000-500	8879110
5.000	5.750	0.625	0.688	37505000-625	8832310
5.250	6.000	0.500	0.550	37505250-500	8905910
5.250	6.000	0.625	0.688	37505250-625	8832610
5.750	6.500	0.500	0.550	37505750-500	8829010
5.750	6.500	0.625	0.688	37505750-625	8832810
6.000	6.750	0.625	0.688	37506000-625	8833010
6.250	7.000	0.500	0.550	37506250-500	8833210
6.250	7.000	0.625	0.688	37506250-625	8833310
6.500	7.250	0.625	0.688	37506500-625	8833410
6.750	7.500	0.625	0.688	37506750-625	8850810
7.000	7.750	0.500	0.550	37507000-500	8859810
7.000	7.750	0.625	0.688	37507000-625	8877610
7.250	8.000	0.625	0.688	37507250-625	8833510
7.750	8.500	0.625	0.688	37507750-625	8859910
8.250	9.000	0.500	0.550	37508250-500	8860010
8.250	9.000	0.625	0.688	37508250-625	8853710
1/2 CROSS SECTION					
1.500	2.500	0.750	0.825	50001500-750	8820310
2.000	3.000	0.750	0.825	50002000-750	8853410
3.000	4.000	0.750	0.825	50003000-750	8850510
3.500	4.500	0.625	0.688	50003500-625	8907810
3.500	4.500	0.750	0.825	50003500-750	8823010
4.000	5.000	0.750	0.825	50004000-750	8853510



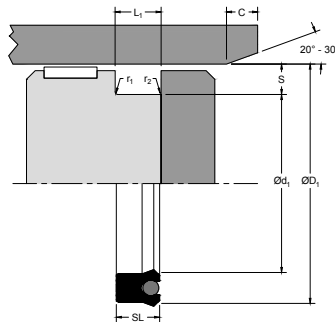
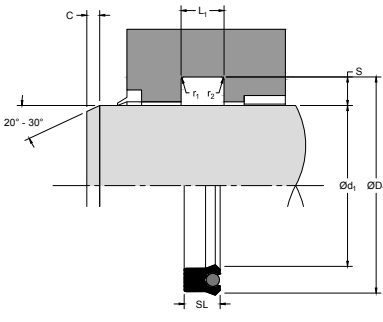
512

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
5.000	6.000	0.750	0.825	50005000-750	8832410
5.500	6.500	0.750	0.825	50005500-750	8823310
6.000	7.000	0.750	0.825	50006000-750	8833110
7.000	8.000	0.750	0.825	50007000-750	8851910
7.500	8.500	0.750	0.825	50007500-750	8820410
8.000	9.000	0.750	0.825	50008000-750	8855210
8.250	9.250	0.750	0.825	50008250-750	8904710
9.000	10.000	0.750	0.825	50009000-750	8922610
10.000	11.000	0.750	0.825	50010000-750	8922710
11.000	12.000	0.750	0.825	50011000-750	8922810



513

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

DESIGN

The Hallite 513 is a standard profile loaded U-cup with precision trimmed sealing lips manufactured in either a polyurethane or polyester shell energised by a high quality O-ring and designed for common North American grooves. The sealing lips are trimmed at an angle to give optimal rod sealing performance. In most cases, the deep profile of the Hallite 513 provides extra stability needed to resist rolling in the groove. Together these features result in improved life and sealing.

At zero or low pressure, the O-ring helps to increase the sealing force preventing any bypass. Under most conditions as the pressure rises, the sealing force increases and the O-ring ensures complete lip actuation.

The symmetry of the Hallite 513 makes it ideally suited for single-acting rod and piston applications. However, the Hallite 513 is not recommended for use in back-to-back double-acting applications.



FEATURES

- Excellent resistance to abrasion
- Deep profile for stability
- Positive lip actuation
- Easy to install
- Precision trimmed lips

MATERIALS

This product comes in a number of material options to extend operating conditions. Contact your local Hallite technical team to decide which is best for your application. Use the part designator in the table below as the last digit of the part number to specify material choice when ordering. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Seal Type	Seal Color	Part Designator
Standard	Hythane® 221-NBR	TPU-EU	Black	10
Optional	TPE 121-NBR	TPE	Orange	11
Optional	TPE 121-FKM	TPE	Orange	12
Optional	Hythane® 361-NBR	TPU-AU	Orange	16



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	0.5 m/sec	1.5 ft/sec
Temperature Range	-40°C +110°C	-40°F +230°F
Maximum Pressure	350 bar	5000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

MAXIMUM EXTRUSION GAP 1/4 SECTION AND ABOVE			
Pressure bar	160	250	350
Maximum Gap mm	0.60	0.50	0.40
Pressure psi	2400	3750	6000
Maximum Gap in	0.024	0.020	0.016

NOTE

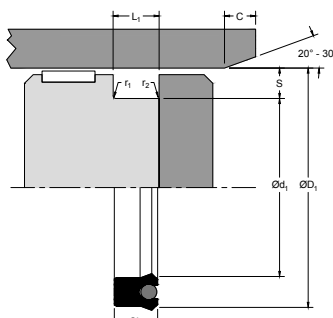
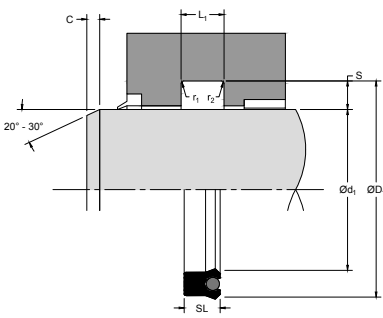
Figures show the maximum permissible gap all on one side, for rod seals using minimum rod $\varnothing$ and maximum clearance $\varnothing$ and for piston seals using the minimum clearance $\varnothing$ and maximum bore $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing d_1$ - Rod	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing D_1$ - Rod	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Dynamic Sealing Face $\varnothing D_1$ - Piston	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing d_1$ - Piston	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

RADII						
Groove Section $\leq S$ in	0.125	0.187	0.250	0.312	0.375	0.500
Min Chamfer C in	0.093	0.093	0.125	0.156	0.187	0.187
Max Fillet Rad r_1 in	0.008	0.008	0.016	0.032	0.032	0.032
Max Fillet Rad r_2 in	0.016	0.016	0.032	0.047	0.047	0.047

NOTE

Please refer to specified tolerances in the introduction page of the Hallite 500 Series.



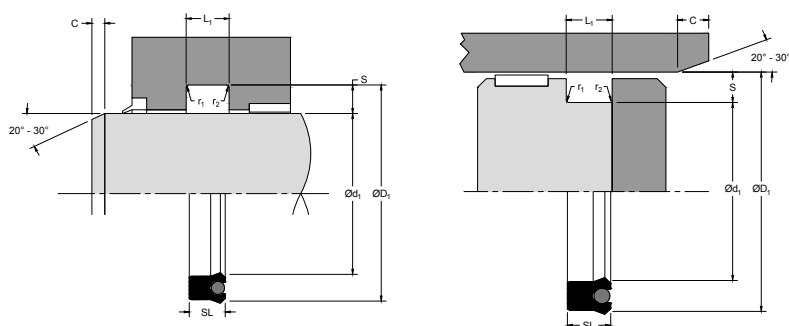
513

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

PART NUMBER RANGE

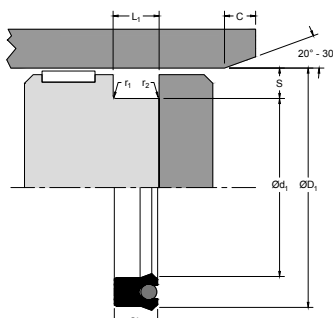
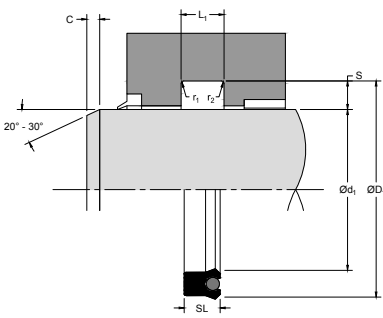
INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
1/8 CROSS SECTION					
0.125	0.375	0.250	0.275	12500125-250B	8922910
0.188	0.438	0.250	0.275	12500188-250B	8923010
0.250	0.500	0.125	0.138	12500250-125B	8933610
0.250	0.500	0.188	0.207	12500250-188B	8845910
0.250	0.500	0.250	0.275	12500250-250B	8878510
0.313	0.563	0.125	0.138	12500313-125B	8923310
0.313	0.563	0.250	0.275	12500313-250B	8923510
0.375	0.625	0.125	0.138	12500375-125B	8908610
0.375	0.625	0.188	0.207	12500375-188B	8923610
0.375	0.625	0.250	0.275	12500375-250B	8823810
0.438	0.688	0.125	0.138	12500438-125B	8902510
0.438	0.688	0.250	0.275	12500438-250B	8846910
0.500	0.750	0.125	0.138	12500500-125B	8907910
0.500	0.750	0.250	0.275	12500500-250B	8834010
0.563	0.813	0.125	0.138	12500563-125B	8923710
0.625	0.875	0.125	0.138	12500625-125B	8906210
0.625	0.875	0.188	0.207	12500625-188B	8848710
0.625	0.875	0.250	0.275	12500625-250B	8834110
0.750	1.000	0.125	0.138	12500750-125B	8905310
0.750	1.000	0.250	0.275	12500750-250B	8834210
0.813	1.063	0.125	0.138	12500813-125B	8924110
0.813	1.063	0.250	0.275	12500813-250B	8924210
0.875	1.125	0.125	0.138	12500875-125B	8924310
0.875	1.125	0.250	0.275	12500875-250B	8845310
0.938	1.188	0.125	0.138	12500937-125B	8924610
0.938	1.188	0.250	0.275	12500937-250B	8900910
1.000	1.250	0.125	0.138	12501000-125B	8924810
1.000	1.250	0.188	0.207	12501000-188B	8860110
1.000	1.250	0.250	0.275	12501000-250B	8834410
1.063	1.313	0.125	0.138	12501063-125B	8925210
1.063	1.313	0.250	0.275	12501063-250B	8845710



PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
1.125	1.375	0.125	0.138	12501125-125B	8899910
1.125	1.375	0.188	0.207	12501125-188B	8855510
1.125	1.375	0.250	0.275	12501125-250B	8855610
1.125	1.375	0.313	0.344	12501125-313B	8848810
1.188	1.438	0.250	0.275	12501188-250B	8848910
1.250	1.500	0.125	0.138	12501250-125B	8925510
1.250	1.500	0.188	0.207	12501250-188B	8860210
1.250	1.500	0.250	0.275	12501250-250B	8834710
1.313	1.563	0.125	0.138	12501313-125B	8926010
1.375	1.625	0.125	0.138	12501375-125B	8926210
1.375	1.625	0.188	0.207	12501375-188B	8860310
1.375	1.625	0.250	0.275	12501375-250B	8834910
1.438	1.688	0.125	0.138	12501438-125B	8926510
1.438	1.688	0.250	0.275	12501438-250B	8849010
1.500	1.750	0.125	0.138	12501500-125B	8926610
1.500	1.750	0.250	0.275	12501500-250B	8835210
1.625	1.875	0.125	0.138	12501625-125B	8926910
1.625	1.875	0.188	0.207	12501625-188B	8849110
1.625	1.875	0.250	0.275	12501625-250B	8873110
1.750	2.000	0.125	0.138	12501750-125B	8927210
1.750	2.000	0.250	0.275	12501750-250B	8835610
1.875	2.125	0.188	0.207	12501875-188B	8845810
1.875	2.125	0.250	0.275	12501875-250B	8845410
2.000	2.250	0.188	0.207	12502000-188B	8860410
2.000	2.250	0.250	0.275	12502000-250B	8873210
2.125	2.375	0.250	0.275	12502125-250B	8908910
2.250	2.500	0.250	0.275	12502250-250B	8908810
2.500	2.750	0.125	0.138	12502500-125B	8928610
2.500	2.750	0.250	0.275	12502500-250B	8902210
2.875	3.125	0.250	0.275	12502875-250B	8847410
3.875	4.125	0.250	0.275	12503875-250B	8845510
4.000	4.250	0.125	0.138	12504000-125B	8930010
4.875	5.125	0.250	0.275	12504875-250B	8845610





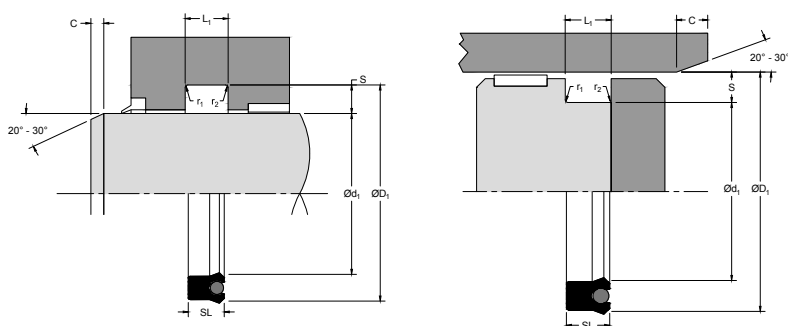
513

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

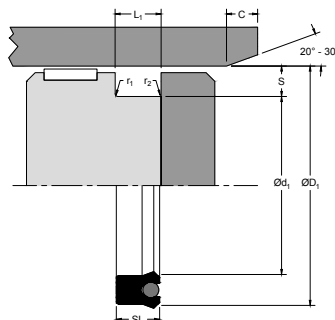
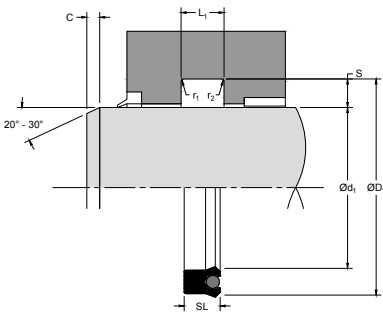
PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
5/32 CROSS SECTION					
1.000	1.313	0.156	0.172	15601000-156B	8925010
1.375	1.688	0.156	0.172	15601375-156B	8926410
3/16 CROSS SECTION					
0.188	0.563	0.188	0.207	18700188-188B	8923110
0.250	0.625	0.188	0.207	18700250-188B	8923210
0.313	0.688	0.188	0.207	18700313-188B	8923410
0.375	0.750	0.156	0.172	18700375-156B	8901410
0.500	0.875	0.250	0.275	18700500-250B	8848010
0.500	0.875	0.313	0.344	18700500-313B	8852910
0.625	1.000	0.188	0.207	18700625-188B	8923810
0.625	1.000	0.313	0.344	18700625-313B	8902710
0.750	1.125	0.188	0.207	18700750-188B	8849810
0.750	1.125	0.250	0.275	18700750-250B	8846010
0.750	1.125	0.313	0.344	18700750-313B	8834310
0.750	1.125	0.375	0.413	18700750-375B	8855810
0.875	1.250	0.188	0.207	18700875-188B	8924410
0.875	1.250	0.313	0.344	18700875-313B	8900210
0.938	1.313	0.313	0.344	18700938-313B	8924710
1.000	1.375	0.188	0.207	18701000-188B	8806110
1.000	1.375	0.250	0.275	18701000-250B	8860510
1.000	1.375	0.281	0.310	18701000-281B	8925110
1.000	1.375	0.313	0.344	18701000-313B	8834510
1.063	1.438	0.313	0.344	18701063-313B	8850010
1.125	1.500	0.188	0.207	18701125-188B	8907710
1.125	1.500	0.250	0.275	18701125-250B	8844910
1.125	1.500	0.313	0.344	18701125-313B	8834610
1.188	1.563	0.188	0.207	18701188-188B	8925410
1.188	1.563	0.313	0.344	18701188-313B	8902310
1.250	1.625	0.188	0.207	18701250-188B	8925610
1.250	1.625	0.250	0.275	18701250-250B	8860610
1.250	1.625	0.313	0.344	18701250-313B	8834810



PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
1.250	1.625	0.375	0.413	18701250-375B	8860710
1.313	1.688	0.313	0.344	18701313-313B	8925910
1.375	1.750	0.188	0.207	18701375-188B	8926110
1.375	1.750	0.250	0.275	18701375-250B	8844710
1.375	1.750	0.313	0.344	18701375-313B	8835010
1.375	1.750	0.375	0.413	18701375-375B	8835110
1.500	1.875	0.188	0.207	18701500-188B	8851510
1.500	1.875	0.250	0.275	18701500-250B	8835310
1.500	1.875	0.313	0.344	18701500-313B	8849710
1.500	1.875	0.375	0.413	18701500-375B	8835410
1.500	1.875	0.406	0.447	18701500-406B	8848110
1.625	2.000	0.188	0.207	18701625-188B	8926810
1.625	2.000	0.250	0.275	18701625-250B	8868410
1.625	2.000	0.313	0.344	18701625-313B	8864210
1.625	2.000	0.375	0.413	18701625-375B	8835510
1.750	2.125	0.188	0.207	18701750-188B	8927010
1.750	2.125	0.230	0.250	18701750-230B	8852010
1.750	2.125	0.250	0.275	18701750-250B	8927110
1.750	2.125	0.313	0.344	18701750-313B	8865410
1.750	2.125	0.375	0.413	18701750-375B	8835710
1.875	2.250	0.188	0.207	18701875-188B	8927310
1.875	2.250	0.375	0.413	18701875-375B	8835810
2.000	2.375	0.188	0.207	18702000-188B	8927410
2.000	2.375	0.230	0.250	18702000-230B	8806210
2.000	2.375	0.250	0.275	18702000-250B	8868110
2.000	2.375	0.266	0.292	18702000-266B	8927710
2.000	2.375	0.313	0.344	18702000-313B	8860810
2.000	2.375	0.375	0.413	18702000-375B	8835910
2.125	2.500	0.188	0.207	18702125-188B	8908110
2.125	2.500	0.250	0.275	18702125-250B	8845010
2.125	2.500	0.375	0.413	18702125-375B	8836010
2.250	2.625	0.188	0.207	18702250-188B	8927910



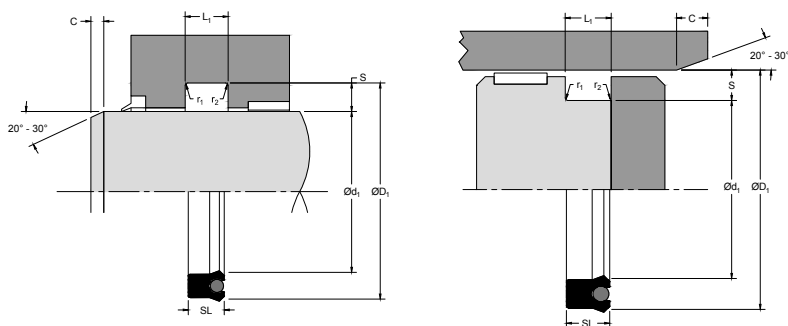
513

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

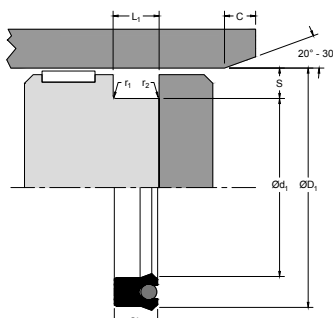
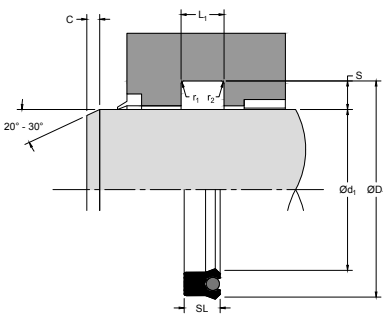
PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
2.250	2.625	0.313	0.344	18702250-313B	8860910
2.250	2.625	0.375	0.413	18702250-375B	8873310
2.375	2.750	0.188	0.207	18702375-188B	8928110
2.375	2.750	0.280	0.308	18702375-280B	8903010
2.375	2.750	0.375	0.413	18702375-375B	8861010
2.500	2.875	0.188	0.207	18702500-188B	8928410
2.500	2.875	0.250	0.275	18702500-250B	8908310
2.500	2.875	0.375	0.413	18702500-375B	8836210
2.625	3.000	0.188	0.207	18702625-188B	8928710
2.625	3.000	0.250	0.275	18702625-250B	8868510
2.625	3.000	0.313	0.344	18702625-313B	8864310
2.625	3.000	0.375	0.413	18702625-375B	8836310
2.750	3.125	0.188	0.207	18702750-188B	8849910
2.750	3.125	0.313	0.344	18702750-313B	8846110
2.750	3.125	0.375	0.413	18702750-375B	8836410
2.875	3.250	0.250	0.275	18702875-250B	8861120
2.875	3.250	0.280	0.308	18702875-280B	8903110
2.875	3.250	0.375	0.413	18702875-375B	8861110
3.000	3.375	0.188	0.207	18703000-188B	8806710
3.000	3.375	0.250	0.275	18703000-250B	8868210
3.000	3.375	0.313	0.344	18703000-313B	8861210
3.000	3.375	0.375	0.413	18703000-375B	8836510
3.125	3.500	0.188	0.207	18703125-188B	8908710
3.125	3.500	0.250	0.275	18703125-250B	8845110
3.125	3.500	0.375	0.413	18703125-375B	8836610
3.250	3.625	0.313	0.344	18703250-313B	8861310
3.250	3.625	0.375	0.413	18703250-375B	8873410
3.375	3.750	0.188	0.207	18703375-188B	8932910
3.375	3.750	0.250	0.275	18703375-250B	8836720
3.375	3.750	0.280	0.308	18703375-280B	8903210
3.375	3.750	0.375	0.413	18703375-375B	8836710
3.500	3.875	0.188	0.207	18703500-188B	8929510



PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
3.500	3.875	0.375	0.413	18703500-375B	8836810
3.625	4.000	0.188	0.207	18703625-188B	8929710
3.625	4.000	0.250	0.275	18703625-250B	8868610
3.625	4.000	0.313	0.344	18703625-313B	8864410
3.625	4.000	0.375	0.413	18703625-375B	8836910
3.750	4.125	0.188	0.207	18703750-188B	8850210
3.750	4.125	0.313	0.344	18703750-313B	8846210
3.750	4.125	0.375	0.413	18703750-375B	8837010
3.875	4.250	0.250	0.275	18703875-250B	8861420
3.875	4.250	0.280	0.308	18703875-280B	8903310
3.875	4.250	0.375	0.413	18703875-375B	8861410
4.000	4.375	0.188	0.207	18704000-188B	8820010
4.000	4.375	0.250	0.275	18704000-250B	8868310
4.000	4.375	0.313	0.344	18704000-313B	8861510
4.000	4.375	0.375	0.413	18704000-375B	8837110
4.125	4.500	0.250	0.275	18704125-250B	8845210
4.125	4.500	0.375	0.413	18704125-375B	8837210
4.250	4.625	0.313	0.344	18704250-313B	8861610
4.250	4.625	0.375	0.413	18704250-375B	8837310
4.375	4.750	0.280	0.308	18704375-280B	8903410
4.375	4.750	0.375	0.413	18704375-375B	8861710
4.500	4.875	0.375	0.413	18704500-375B	8837510
4.625	5.000	0.250	0.275	18704625-250B	8868710
4.625	5.000	0.313	0.344	18704625-313B	8864510
4.625	5.000	0.375	0.413	18704625-375B	8837610
4.750	5.125	0.375	0.413	18704750-375B	8846610
4.875	5.250	0.280	0.308	18704875-280B	8903510
4.875	5.250	0.375	0.413	18704875-375B	8861810
5.000	5.375	0.375	0.413	18705000-375B	8842510
5.500	5.875	0.375	0.413	18705500-375B	8905710



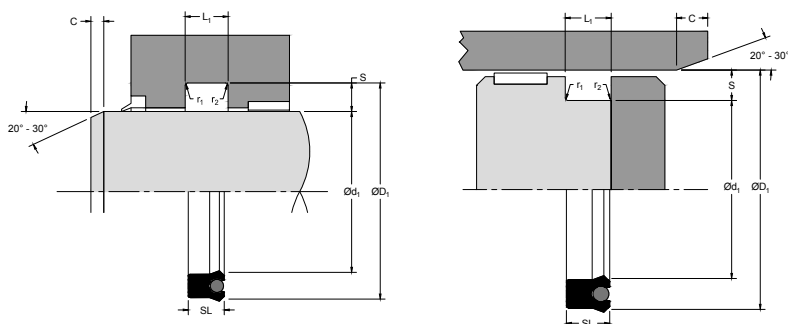
513

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

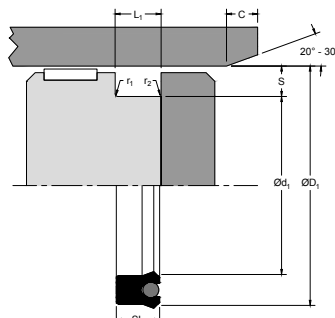
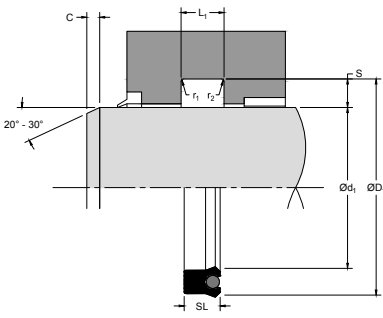
PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
1/4 CROSS SECTION					
0.438	0.938	0.375	0.413	25000438-375B	8863110
0.500	1.000	0.375	0.413	25000500-375B	8837710
0.625	1.125	0.313	0.344	25000625-313B	8849210
0.625	1.125	0.375	0.413	25000625-375B	8923910
0.750	1.250	0.250	0.275	25000750-250B	8924010
0.750	1.250	0.375	0.413	25000750-375B	8837810
0.875	1.375	0.250	0.275	25000875-250B	8924510
0.875	1.375	0.313	0.344	25000875-313B	8830210
0.875	1.375	0.375	0.413	25000875-375B	8864610
1.000	1.500	0.250	0.275	25001000-250B	8924910
1.000	1.500	0.375	0.413	25001000-375B	8837910
1.125	1.625	0.250	0.275	25001125-250B	8804910
1.125	1.625	0.375	0.413	25001125-375B	8856110
1.250	1.750	0.250	0.275	25001250-250B	8925710
1.250	1.750	0.375	0.413	25001250-375B	8838110
1.313	1.813	0.375	0.413	25001313-375B	8902610
1.375	1.875	0.250	0.275	25001375-250B	8926310
1.375	1.875	0.375	0.413	25001375-375B	8878610
1.500	2.000	0.250	0.275	25001500-250B	8908410
1.500	2.000	0.313	0.344	25001500-313B	8867710
1.500	2.000	0.375	0.413	25001500-375B	8838310
1.625	2.125	0.375	0.413	25001625-375B	8849610
1.750	2.250	0.250	0.275	25001750-250B	8805610
1.750	2.250	0.375	0.413	25001750-375B	8838510
1.875	2.375	0.375	0.413	25001875-375B	8859410
2.000	2.500	0.250	0.275	25002000-250B	8856010
2.000	2.500	0.375	0.413	25002000-375B	8838610
2.125	2.625	0.250	0.275	25002125-250B	8805810
2.125	2.625	0.375	0.413	25002125-375B	8856310
2.250	2.750	0.375	0.413	25002250-375B	8838710
2.375	2.875	0.375	0.413	25002375-375B	8850110



PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
2.375	2.875	0.563	0.619	25002375-563B	8900610
2.500	3.000	0.250	0.275	25002500-250B	8928310
2.500	3.000	0.313	0.344	25002500-313B	8867810
2.500	3.000	0.375	0.413	25002500-375B	8839010
2.625	3.125	0.375	0.413	25002625-375B	8849310
2.750	3.250	0.250	0.275	25002750-250B	8805910
2.750	3.250	0.375	0.413	25002750-375B	8839110
2.875	3.375	0.375	0.413	25002875-375B	8830910
3.000	3.500	0.250	0.275	25003000-250B	8928810
3.000	3.500	0.375	0.413	25003000-375B	8839310
3.000	3.500	0.500	0.550	25003000-500B	8842110
3.000	3.500	0.563	0.619	25003000-563B	8852210
3.125	3.625	0.250	0.275	25003125-250B	8848510
3.125	3.625	0.375	0.413	25003125-375B	8856210
3.250	3.750	0.375	0.413	25003250-375B	8839410
3.375	3.875	0.250	0.275	25003375-250B	8929310
3.375	3.875	0.375	0.413	25003375-375B	8849410
3.375	3.875	0.563	0.619	25003375-563B	8900710
3.500	4.000	0.250	0.275	25003500-250B	8929410
3.500	4.000	0.313	0.344	25003500-313B	8867910
3.500	4.000	0.375	0.413	25003500-375B	8839510
3.625	4.125	0.375	0.413	25003625-375B	8849510
3.750	4.250	0.250	0.275	25003750-250B	8848610
3.750	4.250	0.375	0.413	25003750-375B	8839710
3.750	4.250	0.563	0.619	25003750-563B	8839810
3.875	4.375	0.375	0.413	25003875-375B	8832510
4.000	4.500	0.250	0.275	25004000-250B	8929910
4.000	4.500	0.375	0.413	25004000-375B	8840010
4.000	4.500	0.500	0.550	25004000-500B	8867510
4.000	4.500	0.563	0.619	25004000-563B	8840110
4.125	4.625	0.250	0.275	25004125-250B	8806010
4.125	4.625	0.375	0.413	25004125-375B	8856410



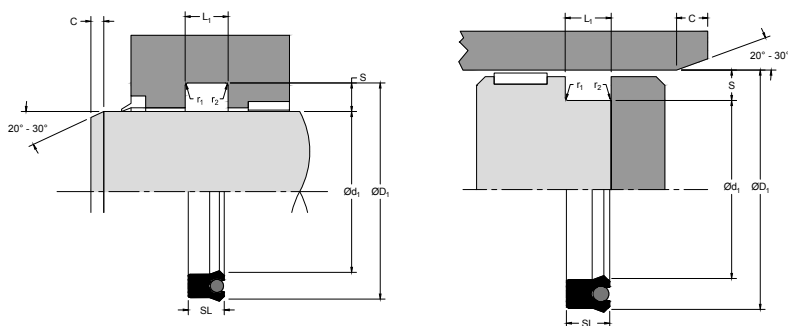
513

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

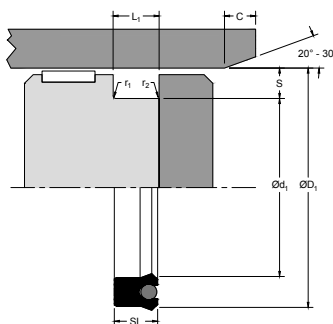
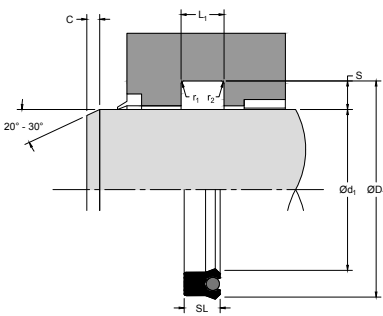
PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
4.250	4.750	0.250	0.275	25004250-250B	8930310
4.250	4.750	0.375	0.413	25004250-375B	8840210
4.250	4.750	0.563	0.619	25004250-563B	8905810
4.375	4.875	0.250	0.275	25004375-250B	8848310
4.375	4.875	0.563	0.619	25004375-563B	8900510
4.500	5.000	0.250	0.275	25004500-250B	8817110
4.500	5.000	0.313	0.344	25004500-313B	8868010
4.500	5.000	0.375	0.413	25004500-375B	8840510
4.500	5.000	0.500	0.550	25004500-500B	8864710
4.500	5.000	0.563	0.619	25004500-563B	8840610
4.625	5.125	0.250	0.275	25004625-250B	8848410
4.750	5.250	0.250	0.275	25004750-250B	8930810
4.750	5.250	0.375	0.413	25004750-375B	8861910
4.750	5.250	0.500	0.550	25004750-500B	8846310
4.750	5.250	0.563	0.619	25004750-563B	8840910
4.875	5.375	0.375	0.413	25004875-375B	8832910
4.875	5.375	0.563	0.619	25004875-563B	8930910
5.000	5.500	0.250	0.275	25005000-250B	8931210
5.000	5.500	0.375	0.413	25005000-375B	8841010
5.000	5.500	0.500	0.550	25005000-500B	8866810
5.000	5.500	0.563	0.619	25005000-563B	8841110
5.250	5.750	0.563	0.619	25005250-563B	8862010
5.500	6.000	0.375	0.413	25005500-375B	8841310
5.500	6.000	0.500	0.550	25005500-500B	8833610
5.500	6.000	0.563	0.619	25005500-563B	8841410
5.625	6.125	0.563	0.619	25005625-563B	8903610
5.750	6.250	0.375	0.413	25005750-375B	8866410
5.750	6.250	0.563	0.619	25005750-563B	8841610
6.000	6.500	0.375	0.413	25006000-375B	8852310
6.000	6.500	0.500	0.550	25006000-500B	8867610
6.000	6.500	0.563	0.619	25006000-563B	8841710
6.250	6.750	0.563	0.619	25006250-563B	8905610



PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
6.500	7.000	0.250	0.275	25006500-250B	8899410
6.500	7.000	0.375	0.413	25006500-375B	8852610
6.500	7.000	0.500	0.550	25006500-500B	8846410
6.500	7.000	0.563	0.619	25006500-563B	8841910
6.750	7.250	0.375	0.413	25006750-375B	8865910
6.750	7.250	0.500	0.550	25006750-500B	8866010
6.750	7.250	0.563	0.619	25006750-563B	8866310
7.000	7.500	0.375	0.413	25007000-375B	8852410
7.000	7.500	0.500	0.550	25007000-500B	8842410
7.000	7.500	0.563	0.619	25007000-563B	8877910
7.250	7.750	0.563	0.619	25007250-563B	8862110
7.500	8.000	0.250	0.275	25007500-250B	8932410
7.500	8.000	0.375	0.413	25007500-375B	8852510
7.500	8.000	0.500	0.550	25007500-500B	8833810
7.500	8.000	0.563	0.619	25007500-563B	8852810
8.000	8.500	0.250	0.275	25008000-250B	8904610
8.000	8.500	0.375	0.413	25008000-375B	8848210
8.000	8.500	0.563	0.619	25008000-563B	8842310
8.500	9.000	0.375	0.413	25008500-375B	8852710
8.500	9.000	0.500	0.550	25008500-500B	8833910
8.500	9.000	0.563	0.619	25008500-563B	8853010
9.500	10.000	0.563	0.619	25009500-563B	8932610
10.000	10.500	0.563	0.619	25010000-563B	8932710
5/16 CROSS SECTION					
1.000	1.625	0.375	0.413	31201000-375B	8828310
1.000	1.625	0.500	0.550	31201000-500B	8838010
1.125	1.750	0.313	0.344	31201125-313B	8925310
1.125	1.750	0.500	0.550	31201125-500B	8879810
1.250	1.875	0.313	0.344	31201250-313B	8809810
1.250	1.875	0.500	0.550	31201250-500B	8838210
1.375	2.000	0.313	0.344	31201375-313B	8825110
1.375	2.000	0.500	0.550	31201375-500B	8873510



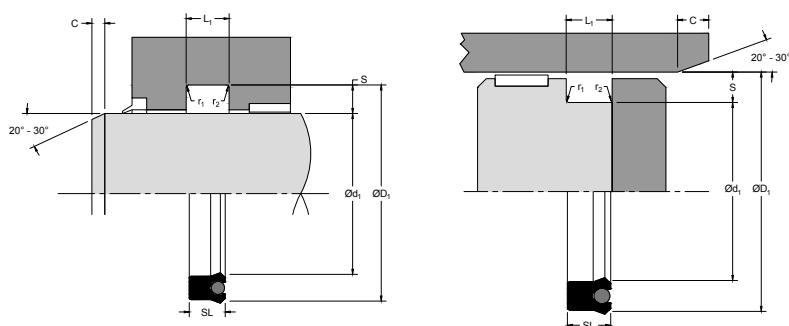
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ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

PART NUMBER RANGE

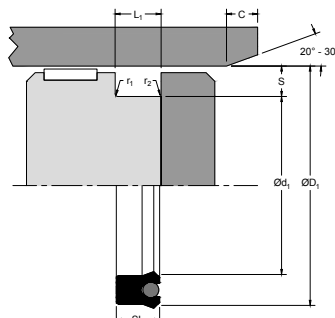
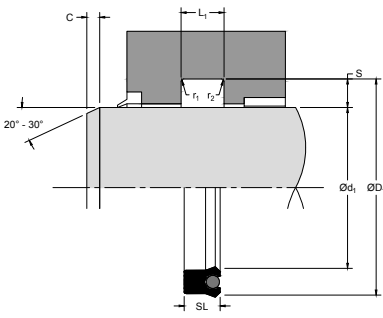
INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
1.500	2.125	0.313	0.344	31201500-313B	8926710
1.500	2.125	0.375	0.413	31201500-375B	8846510
1.500	2.125	0.500	0.550	31201500-500B	8838410
1.750	2.375	0.375	0.413	31201750-375B	8868810
1.750	2.375	0.500	0.550	31201750-500B	8873610
1.875	2.500	0.500	0.550	31201875-500B	8873710
2.000	2.625	0.500	0.550	31202000-500B	8873810
2.000	2.625	0.563	0.619	31202000-563B	8862210
2.125	2.750	0.313	0.344	31202125-313B	8927810
2.125	2.750	0.500	0.550	31202125-500B	8879910
2.125	2.750	0.625	0.688	31202125-625B	8864810
2.250	2.875	0.313	0.344	31202250-313B	8816310
2.250	2.875	0.500	0.550	31202250-500B	8838810
2.375	3.000	0.313	0.344	31202375-313B	8827210
2.375	3.000	0.500	0.550	31202375-500B	8838910
2.500	3.125	0.375	0.413	31202500-375B	8836110
2.500	3.125	0.500	0.550	31202500-500B	8873910
2.625	3.250	0.500	0.550	31202625-500B	8933310
2.750	3.375	0.375	0.413	31202750-375B	8868910
2.750	3.375	0.500	0.550	31202750-500B	8839210
2.875	3.500	0.500	0.550	31202875-500B	8874010
3.000	3.625	0.313	0.344	31203000-312B	8929010
3.000	3.625	0.375	0.413	31203000-375B	8828510
3.000	3.625	0.500	0.550	31203000-500B	8874110
3.125	3.750	0.313	0.344	31203125-313B	8929210
3.125	3.750	0.500	0.550	31203125-500B	8869810
3.250	3.875	0.313	0.344	31203250-313B	8820110
3.250	3.875	0.500	0.550	31203250-500B	8869710
3.375	4.000	0.313	0.344	31203375-313B	8827410
3.375	4.000	0.500	0.550	31203375-500B	8874210
3.500	4.125	0.375	0.413	31203500-375B	8837410
3.500	4.125	0.500	0.550	31203500-500B	8874310



PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
3.625	4.250	0.375	0.413	31203625-375B	8933910
3.750	4.375	0.375	0.413	31203750-375B	8869010
3.750	4.375	0.500	0.550	31203750-500B	8874410
3.875	4.500	0.500	0.550	31203875-500B	8839910
4.000	4.625	0.500	0.550	31204000-500B	8874510
4.000	4.625	0.563	0.619	31204000-563B	8862310
4.125	4.750	0.500	0.550	31204125-500B	8869610
4.125	4.750	0.625	0.688	31204125-625B	8869510
4.250	4.875	0.313	0.344	31204250-313B	8821610
4.250	4.875	0.500	0.550	31204250-500B	8869410
4.250	4.875	0.563	0.619	31204250-563B	8930210
4.375	5.000	0.313	0.344	31204375-313B	8827610
4.375	5.000	0.500	0.550	31204375-500B	8874610
4.375	5.000	0.625	0.688	31204375-625B	8840410
4.500	5.125	0.375	0.413	31204500-375B	8840710
4.500	5.125	0.625	0.688	31204500-625B	8840810
4.750	5.375	0.500	0.550	31204750-500B	8869310
4.750	5.375	0.625	0.688	31204750-625B	8862410
5.000	5.625	0.625	0.688	31205000-625B	8874710
5.250	5.875	0.625	0.688	31205250-625B	8862510
5.375	6.000	0.313	0.344	31205375-313B	8931510
5.375	6.000	0.375	0.413	31205375-375B	8931610
5.375	6.000	0.625	0.688	31205375-625B	8841210
5.500	6.125	0.313	0.344	31205500-313B	8931810
5.500	6.125	0.625	0.688	31205500-625B	8933810
6.000	6.625	0.625	0.688	31206000-625B	8862610
6.375	7.000	0.625	0.688	31206375-625B	8841810
6.500	7.125	0.625	0.688	31206500-625B	8869110
6.750	7.375	0.625	0.688	31206750-625B	8862710
7.000	7.625	0.625	0.688	31207000-625B	8854810
7.250	7.875	0.625	0.688	31207250-625B	8862810
7.375	8.000	0.500	0.550	31207375-500B	8842610





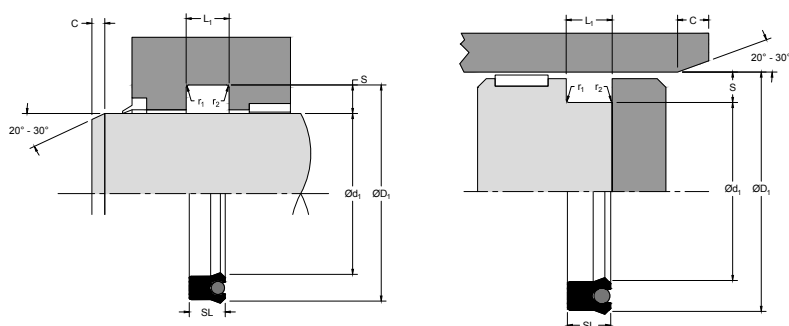
513

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

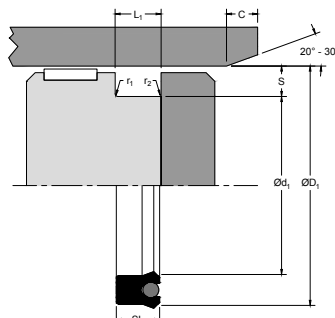
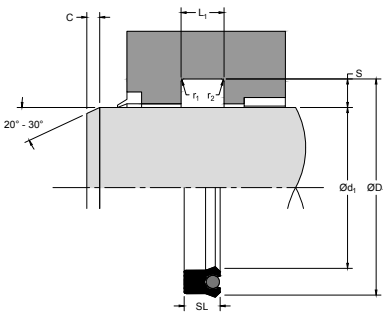
PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
7.375	8.000	0.625	0.688	31207375-625B	8864910
8.000	8.625	0.500	0.550	31208000-500B	8866610
8.000	8.625	0.625	0.688	31208000-625B	8904810
8.500	9.125	0.625	0.688	31208500-625B	8862910
3/8 CROSS SECTION					
1.250	2.000	0.375	0.413	37501250-375B	8925810
1.250	2.000	0.500	0.550	37501250-500B	8842010
1.375	2.125	0.625	0.688	37501375-625B	8933510
1.500	2.250	0.500	0.550	37501500-500B	8874810
1.500	2.250	0.625	0.688	37501500-625B	8842710
1.625	2.375	0.375	0.413	37501625-375B	8901010
1.750	2.500	0.500	0.550	37501750-500B	8874910
1.750	2.500	0.625	0.688	37501750-625B	8875010
2.000	2.750	0.375	0.413	37502000-375B	8927610
2.000	2.750	0.500	0.550	37502000-500B	8875110
2.000	2.750	0.625	0.688	37502000-625B	8842810
2.250	3.000	0.375	0.413	37502250-375B	8928010
2.250	3.000	0.500	0.550	37502250-500B	8875210
2.250	3.000	0.625	0.688	37502250-625B	8842910
2.375	3.125	0.625	0.688	37502375-625B	8846810
2.500	3.250	0.375	0.413	37502500-375B	8928510
2.500	3.250	0.500	0.550	37502500-500B	8875310
2.500	3.250	0.625	0.688	37502500-625B	8843010
2.625	3.375	0.625	0.688	37502625-625B	8863710
2.750	3.500	0.500	0.550	37502750-500B	8875410
2.750	3.500	0.625	0.688	37502750-625B	8843110
3.000	3.750	0.375	0.413	37503000-375B	8928910
3.000	3.750	0.500	0.550	37503000-500B	8875510
3.000	3.750	0.625	0.688	37503000-625B	8843210
3.125	3.875	0.375	0.413	37503125-375B	8929110
3.125	3.875	0.625	0.688	37503125-625B	8900310
3.250	4.000	0.500	0.550	37503250-500B	8875610



PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
3.250	4.000	0.625	0.688	37503250-625B	8843310
3.375	4.125	0.625	0.688	37503375-625B	8852110
3.500	4.250	0.500	0.550	37503500-500B	8875710
3.500	4.250	0.625	0.688	37503500-625B	8843410
3.625	4.375	0.625	0.688	37503625-625B	8865310
3.750	4.500	0.375	0.413	37503750-375B	8929810
3.750	4.500	0.500	0.550	37503750-500B	8875810
3.750	4.500	0.625	0.688	37503750-625B	8875910
4.000	4.750	0.500	0.550	37504000-500B	8876010
4.000	4.750	0.625	0.688	37504000-625B	8843510
4.250	5.000	0.375	0.413	37504250-375B	8867410
4.250	5.000	0.500	0.550	37504250-500B	8876110
4.250	5.000	0.625	0.688	37504250-625B	8843610
4.500	5.250	0.375	0.413	37504500-375B	8930410
4.500	5.250	0.500	0.550	37504500-500B	8876210
4.500	5.250	0.625	0.688	37504500-625B	8843710
4.750	5.500	0.375	0.413	37504750-375B	8930610
4.750	5.500	0.500	0.550	37504750-500B	8876310
4.750	5.500	0.625	0.688	37504750-625B	8876410
5.000	5.750	0.375	0.413	37505000-375B	8931010
5.000	5.750	0.500	0.550	37505000-500B	8876510
5.000	5.750	0.625	0.688	37505000-625B	8843810
5.250	6.000	0.375	0.413	37505250-375B	8931310
5.250	6.000	0.500	0.550	37505250-500B	8865010
5.250	6.000	0.625	0.688	37505250-625B	8843910
5.250	6.000	0.750	0.825	37505250-750B	8854410
5.500	6.250	0.375	0.413	37505500-375B	8931710
5.500	6.250	0.500	0.550	37505500-500B	8863010
5.500	6.250	0.625	0.688	37505500-625B	8844010
5.750	6.500	0.500	0.550	37505750-500B	8866110
5.750	6.500	0.625	0.688	37505750-625B	8878010
5.875	6.625	0.625	0.688	37505875-625B	8900410



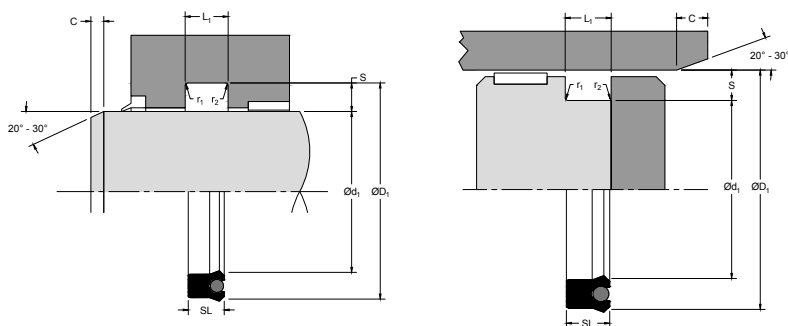
513

ROD/PISTON SEAL

*Single-Acting
TPU/TPE with O-Ring Energizer*

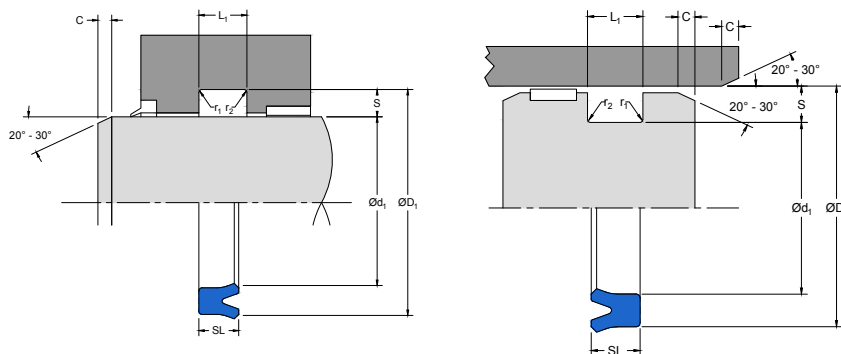
PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
6.000	6.750	0.375	0.413	37506000-375B	8931910
6.000	6.750	0.500	0.550	37506000-500B	8866210
6.000	6.750	0.625	0.688	37506000-625B	8844110
6.250	7.000	0.500	0.550	37506250-500B	8902410
6.250	7.000	0.625	0.688	37506250-625B	8844210
6.500	7.250	0.375	0.413	37506500-375B	8932110
6.500	7.250	0.500	0.550	37506500-500B	8853310
6.500	7.250	0.625	0.688	37506500-625B	8844310
6.750	7.500	0.375	0.413	37506750-375B	8932210
6.750	7.500	0.500	0.550	37506750-500B	8854610
6.750	7.500	0.625	0.688	37506750-625B	8854710
7.000	7.750	0.500	0.550	37507000-500B	8854010
7.000	7.750	0.625	0.688	37507000-625B	8844410
7.250	8.000	0.375	0.413	37507250-375B	8932310
7.250	8.000	0.500	0.550	37507250-500B	8865110
7.250	8.000	0.625	0.688	37507250-625B	8844510
7.250	8.000	0.750	0.825	37507250-750B	8854510
7.500	8.250	0.500	0.550	37507500-500B	8863210
7.500	8.250	0.625	0.688	37507500-625B	8878110
7.750	8.500	0.500	0.550	37507750-500B	8865210
7.750	8.500	0.625	0.688	37507750-625B	8853610
8.000	8.750	0.625	0.688	37508000-625B	8878210
8.250	9.000	0.625	0.688	37508250-625B	8854110
8.750	9.500	0.500	0.550	37508750-500B	8934810
9.000	9.750	0.375	0.413	37509000-375B	8932510
9.500	10.250	0.625	0.688	37509500-625B	8933710
10.250	11.000	0.500	0.550	37510250-500B	8934710
1/2 CROSS SECTION					
1.750	2.750	0.750	0.825	50001750-750B	8847010
2.000	3.000	0.500	0.550	50002000-500B	8927510
2.000	3.000	0.750	0.825	50002000-750B	8876810
2.375	3.375	0.500	0.550	50002375-500B	8928210



PART NUMBER RANGE

INCH					
Ød ₁	ØD ₁	SL	L ₁	Standard Reference	PART No.
2.500	3.500	0.750	0.825	50002500-750B	8847110
3.000	4.000	0.750	0.825	50003000-750B	8863310
4.000	5.000	0.500	0.550	50004000-500B	8930110
4.000	5.000	0.750	0.825	50004000-750B	8877410
4.250	5.250	0.750	0.825	50004250-750B	8847210
4.500	5.500	0.500	0.550	50004500-500B	8930510
4.500	5.500	0.750	0.825	50004500-750B	8847310
4.750	5.750	0.750	0.825	50004750-750B	8930710
5.000	6.000	0.750	0.825	50005000-750B	8907610
5.000	6.000	0.750	0.825	50005000-750B	8931110
5.250	6.250	0.500	0.550	50005250-500B	8931410
5.250	6.250	0.750	0.825	50005250-750B	8847510
6.000	7.000	0.750	0.825	50006000-750B	8863410
6.000	7.000	0.750	0.825	50006000-750B	8932010
6.250	7.250	0.750	0.825	50006250-750B	8847710
7.000	8.000	0.750	0.825	50007000-750B	8870410
7.250	8.250	0.750	0.825	50007250-750B	8847810
7.750	8.750	0.750	0.825	50007750-750B	8847910
8.000	9.000	0.750	0.825	50008000-750B	8863510
3/4 CROSS SECTION					
3.500	5.000	0.750	0.825	75003500-750B	8929610



601

ROD/PISTON SEAL

*Single-Acting
Polyurethane*

DESIGN

The Hallite 601 high-performance, general purpose, single-acting U-ring rod or piston seal is designed to provide a dry sealing solution in light and medium-duty applications and manufactured in Hythane® 181, Hallite's high-performance polyurethane, for easy installation and excellent low temperature performance. The seal can be considered for use in heavy-duty applications when used with a suitable full depth back-up ring. The sealing lips are trimmed at an angle to give optimal sealing performance.

The symmetry of the Hallite 601 makes it ideally suited for single-acting rod or piston applications. The Hallite 601 can also be fitted back-to-back for use in double-acting applications, but the Hallite 606 single-acting piston seal is the preferred option.



FEATURES

- General purpose seal
- Excellent resistance to abrasion
- Positive lip actuation
- Excellent temperature resistance
- Precision trimmed lips
- Easy to install

MATERIALS

As standard, this product comes in the following material. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color
Standard	Hythane® 181	TPU-EU	Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-45°C +110°C	-50°F +230°F
Maximum Pressure	400 bar	6000 psi
Maximum Pressure with Backup Ring	700 bar	10000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

NOTE

Pressure Rating: Can be extended with use of backup ring. Seek technical advice from local Hallite office.

MAXIMUM EXTRUSION GAP			
Pressure bar	160	250	400
Maximum Gap mm	0.60	0.50	0.40
Pressure psi	2400	3750	6000
Maximum Gap in	0.024	0.020	0.016

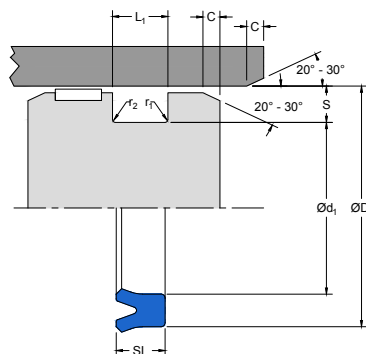
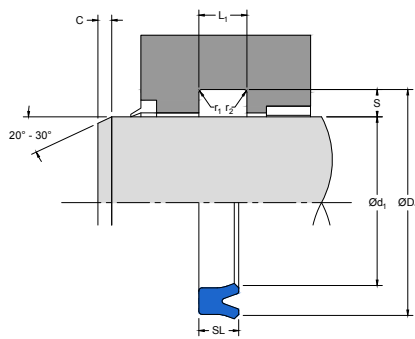
NOTE

Figures show the maximum permissible gap all on one side, for rod seals using minimum rod $\varnothing$ and maximum clearance $\varnothing$ and for piston seals using the minimum clearance $\varnothing$ and maximum bore $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing d_1$ - Rod	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing D_1$ - Rod	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Dynamic Sealing Face $\varnothing D_1$ - Piston	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing d_1$ - Piston	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII							
Groove Section $< S$ mm	4.00	5.00	7.50	10.00	12.50	15.00	20.00
Min Chamfer C mm	3.00	3.50	5.00	6.50	7.00	8.00	10.00
Max Fillet Rad r_1 mm	0.20	0.40	0.80	0.80	1.20	1.60	1.60
Max Fillet Rad r_2 mm	0.40	0.80	1.20	1.20	1.60	2.40	2.40
Groove Section $\leq S$ in	0.125	0.187	0.250	0.312	0.375	0.500	
Min Chamfer C in	0.093	0.093	0.125	0.156	0.187	0.187	
Max Fillet Rad r_1 in	0.008	0.008	0.016	0.032	0.032	0.032	
Max Fillet Rad r_2 in	0.016	0.016	0.032	0.047	0.047	0.047	

TOLERANCES	$\varnothing d_1$	$\varnothing D_1$	L_1 mm	L_1 in
Rod	f9	Js11	+0.25 -0	+0.010 -0
Piston	js11	H9	+0.25 -0	+0.010 -0



601

ROD/PISTON SEAL

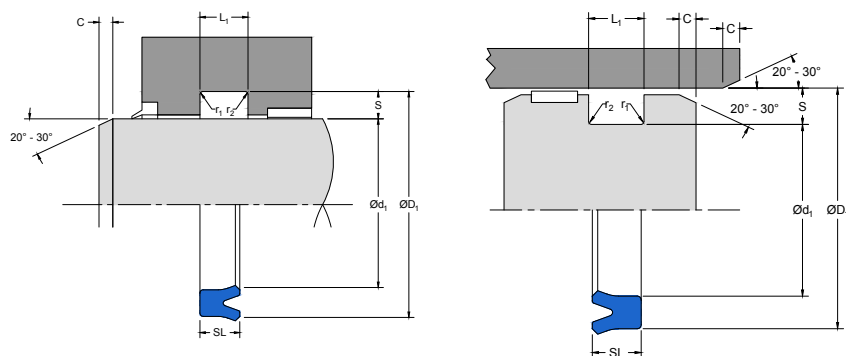
Single-Acting
Polyurethane

PART NUMBER RANGE

INCH						
Ød ₁	TOL f ₉	ØD ₁	TOL Js ₁₁	SL	L ₁ +0.010-0	PART No.
0.500	-0.001 -0.002	0.750	+0.003 -0.003	0.250	0.275	4566500
0.500	-0.001 -0.002	0.875	+0.003 -0.003	0.197	0.218	4300000
0.500	-0.001 -0.002	1.000	+0.003 -0.003	0.250	0.275	4110201
0.625	-0.001 -0.002	1.000	+0.003 -0.003	0.190	0.218	4298300
0.625	-0.001 -0.002	1.125	+0.003 -0.003	0.250	0.275	4509101
0.750	-0.001 -0.003	1.250	+0.003 -0.003	0.250	0.275	4102901
0.875	-0.001 -0.003	1.375	+0.003 -0.003	0.250	0.275	4507101
1.000	-0.001 -0.003	1.500	+0.003 -0.003	0.250	0.275	4111101
1.250	-0.001 -0.003	1.750	+0.003 -0.003	0.250	0.275	4502701
1.250	-0.001 -0.003	1.750	+0.003 -0.003	0.375	0.413	4107001
1.375	-0.001 -0.003	1.750	+0.003 -0.003	0.375	0.413	4353400
1.375	-0.001 -0.003	2.000	+0.004 -0.004	0.266	0.312	4236201
1.500	-0.001 -0.003	2.000	+0.004 -0.004	0.250	0.275	4111001
1.750	-0.001 -0.003	2.250	+0.004 -0.004	0.250	0.275	4502601
1.750	-0.001 -0.003	2.250	+0.004 -0.004	0.375	0.413	4140901

NOTE

For piston sealing tolerances refer to technical details.

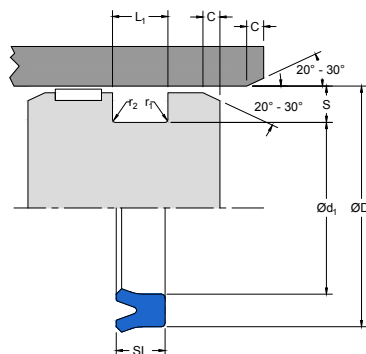
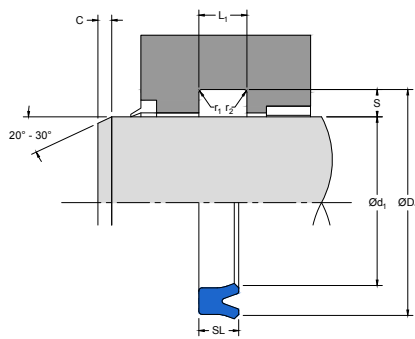


PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
1.750	-0.001 -0.003	2.375	+0.004 -0.004	0.266	0.312	4236301
1.750	-0.001 -0.003	2.375	+0.004 -0.004	0.562	0.619	4250901
2.000	-0.001 -0.004	2.375	+0.004 -0.004	0.250	0.275	4508301
2.000	-0.001 -0.004	2.375	+0.004 -0.004	0.312	0.344	4509201
2.000	-0.001 -0.004	2.500	+0.004 -0.004	0.375	0.413	4353500
2.000	-0.001 -0.004	2.625	+0.004 -0.004	0.500	0.550	4225101
2.000	-0.001 -0.004	2.625	+0.004 -0.004	0.562	0.619	4159801
2.125	-0.001 -0.004	2.500	+0.004 -0.004	0.250	0.275	4508201
2.125	-0.001 -0.004	2.625	+0.004 -0.004	0.375	0.413	4156101
2.250	-0.001 -0.004	2.750	+0.004 -0.004	0.375	0.413	4128701
2.375	-0.001 -0.004	3.000	+0.004 -0.004	0.312	0.344	4107201
2.500	-0.001 -0.004	3.000	+0.004 -0.004	0.375	0.413	4119501
2.500	-0.001 -0.004	3.125	+0.004 -0.004	0.312	0.344	4124401
2.625	-0.001 -0.004	3.125	+0.004 -0.004	0.375	0.413	4224701
2.750	-0.001 -0.004	3.375	+0.004 -0.004	0.562	0.619	4250701

NOTE

For piston sealing tolerances refer to technical details.



601

ROD/PISTON SEAL

Single-Acting
Polyurethane

PART NUMBER RANGE

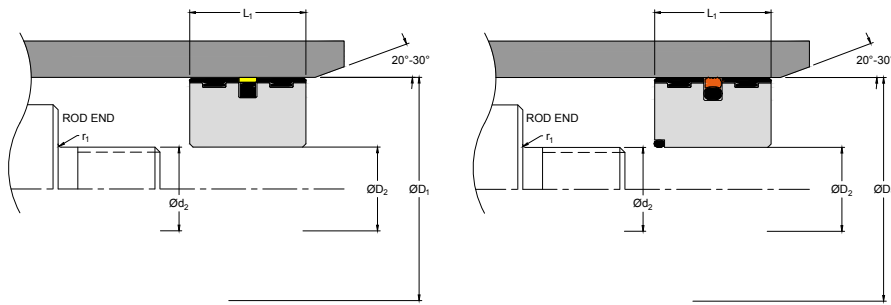
INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
2.875	-0.001 -0.004	3.500	+0.004 -0.004	0.325	0.360	4129701
3.000	-0.001 -0.004	3.500	+0.004 -0.004	0.375	0.413	4866200
3.000	-0.001 -0.004	3.625	+0.004 -0.004	0.562	0.619	4160001
3.750	-0.001 -0.005	4.500	+0.004 -0.004	0.375	0.413	4119201
4.000	-0.001 -0.005	4.500	+0.004 -0.004	0.511	0.562	4373400
4.000	-0.001 -0.005	4.750	+0.005 -0.005	0.375	0.413	4120501
4.000	-0.001 -0.005	4.750	+0.005 -0.005	0.536	0.600	4422500
4.500	-0.001 -0.005	5.000	+0.005 -0.005	0.375	0.413	4129801
4.750	-0.002 -0.006	5.500	+0.005 -0.005	0.360	0.437	4154701
5.000	-0.002 -0.006	5.750	+0.005 -0.005	0.482	0.539	4224801
5.000	-0.002 -0.006	6.000	+0.005 -0.005	0.750	0.825	8901300
5.500	-0.002 -0.006	6.250	+0.005 -0.005	0.375	0.413	4119301
5.750	-0.002 -0.006	6.500	+0.005 -0.005	0.375	0.413	4135301
7.000	-0.002 -0.006	7.500	+0.006 -0.006	0.250	0.275	4806200
7.750	-0.002 -0.006	8.750	+0.006 -0.006	0.500	0.550	4806100

NOTE

For piston sealing tolerances refer to technical details.



UNITIZED PISTONS



720

UNITIZED PISTON

DESIGN

The Hallite 720 is a completely self-contained piston, bearing, and seal-in-one assembly that solves difficult assembly problems and can be a cost-effective alternative to the traditional piston assembly which has a separately fitted seal and bearing(s).

The Hallite 720 improves stability and has smaller extrusion gaps that extend the life of the piston seal. Molding the bearing material over the outer diameter gives an extremely tight fit between the piston and the cylinder bore. The piston diameter is tightly controlled which reduces the tolerance build up and results in increased performance.

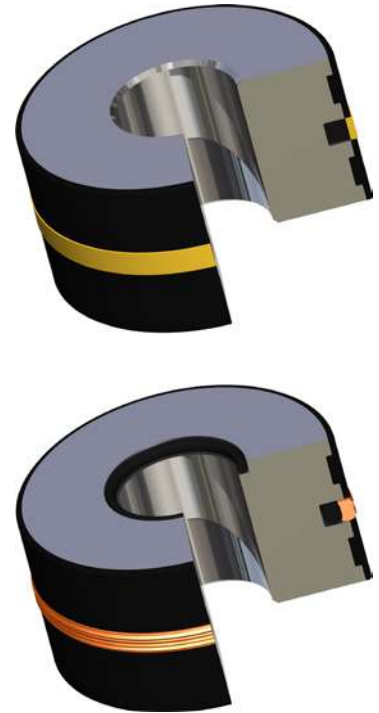
The Hallite 720 unitized piston is constructed using four components:

- High strength steel body
- Non-metallic bearing
- Rubber energizer
- Filled PTFE seal ring for inch sizes
- Polyurethane seal ring for metric sizes

The steel piston body is machined to exact dimensions. The non-metallic bearing material is molded to the piston using a special proprietary process. It is then machined to the final precise outer diameter dimension to suit the cylinder bore and the seal is fitted. It is supplied ready to be attached to the piston rod for use in a cylinder.

In many cases the Hallite 720 is also supplied with an internal static sealing O-ring to provide a positive seal between the piston and the rod. Those marked with an asterisk in the part number range on the following pages do not have this internal seal.

The materials used in the standard unitized piston are selected to handle a broad range of application parameters. Contact your local Hallite technical team to decide which is best for your application.



FEATURES

- Maximum bearing surface area for the piston length
- Works on a variety of cylinder bore finishes
- Increases side load capacity
- Diminishes effect of fluid contamination
- Eliminates metal-to-metal contact and extends seal life
- Compact piston design enables increase in stroke or reduction in overall cylinder length
- Improves supply chain management by reducing warranty claims, increasing manufacturing capacity and reducing inventory

TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-30°C +100°C	-22°F +212°F
Maximum Pressure	350 bar	5000 psi

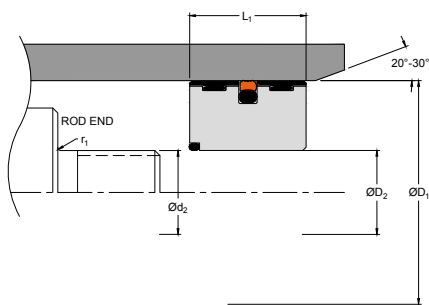
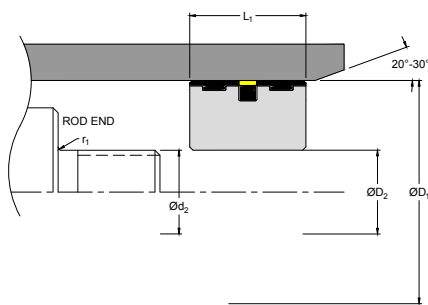
NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face ØD ₁	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face Ød ₂	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Rod End	3.2 max	10 max	16 max	125 max	394 max	630 max

RADII		
Max Fillet Rad r ₁ with Internal O-Ring	3.00	0.125
Max Fillet Rad r ₁ without Internal O-Ring	NA	0.031

TOLERANCES	ØD ₁	ØD ₂	Ød ₂	L ₁
mm	H9	+0.05 -0	f9	+0.20-0
in	H9	+0.002 -0	f9	+0.008-0



720

UNITIZED PISTON

PART NUMBER RANGE

METRIC				
ØD ₁	TOL H9	ØD ₂ +0.05-0	L ₁ +0.20-0	PART No.
32.00	+0.06 0.00	12.00	25.00	7240510
40.00	+0.06 0.00	16.00	25.00	7241010
50.00	+0.06 0.00	20.00	25.00	7241510
60.00	+0.07 0.00	25.00	25.00	7242010
63.00	+0.07 0.00	25.00	25.00	7242510
70.00	+0.07 0.00	25.00	29.00	7243010
80.00	+0.07 0.00	25.00	29.00	7243510
100.00	+0.09 0.00	32.00	40.00	7244010

INCH				
ØD ₁	TOL H9	ØD ₂ +0.002-0	L ₁ +0.008-0	PART No.
1.500	+0.003 0.000	0.500	1.000	H1380*
2.000	+0.003 0.000	0.750	1.000	H1381*
2.250	+0.003 0.000	1.000	1.000	H1443*
2.500	+0.003 0.000	1.000	1.000	H1382*
3.000	+0.003 0.000	1.000	1.000	H1383
3.500	+0.004 0.000	1.000	1.000	H1384
3.500	+0.004 0.000	1.000	1.500	H1385
4.000	+0.004 0.000	1.000	1.000	H1386
4.000	+0.004 0.000	1.000	1.500	H1387
4.500	+0.004 0.000	1.000	1.500	H1388
5.000	+0.004 0.000	1.500	1.250	H1389
5.000	+0.004 0.000	1.500	1.750	H1390

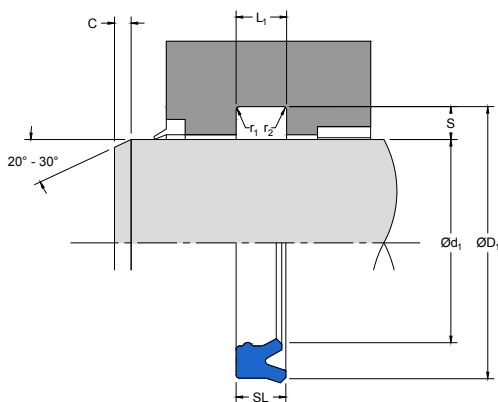
NOTE

Part numbers suffixed by "*" are not fitted with an internal static sealing O-Ring.





ROD SEALS



605

ROD SEAL

*Twin Lip
Polyurethane*

DESIGN

The Hallite 605 twin lip, asymmetric rod seal is designed with precision trimmed sealing lips to provide a dry sealing solution in light and medium-duty applications. The seal can be considered for use in heavy-duty applications when used with a suitable full depth back-up ring. The sealing lips are precision trimmed at an angle to give optimal rod sealing performance.

The range covers most standard housings used in Europe, North America and Asia.

The Hallite 605 is designed to have interference in the seal housing groove and has a secondary lip. The secondary sealing lip located behind the primary sealing lip improves stability of the seal in the gland. The inner dynamic lip is shorter and more robust to improving sealing and compression set characteristics over conventional, symmetrical U-rings.

The Hallite 605 is molded in Hythane® 181, Hallite's high-performance polyurethane, for easy installation and excellent low temperature performance.



FEATURES

- General purpose rod seal
- Robust design
- Excellent wear resistance
- Increase seal stability
- Performs well over wide temperature range and is extremely effective in low temperatures
- Primary lip protection
- Easy to install

MATERIALS

As standard, this product comes in the following material. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color
Standard	Hythane® 181	TPU-EU	Blue



TECHNICAL DETAILS

OPERATING CONDITIONSS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-45°C +110°C	-50°F +230°F
Maximum Pressure	400 bar	6000 psi
Maximum Pressure with Backup Ring	700 bar	10000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

NOTE

Pressure Rating: Can be extended with use of back-up ring. Seek technical advice from local Hallite office.

MAXIMUM EXTRUSION GAP			
Pressure bar	160	250	400
Maximum Gap mm	0.60	0.50	0.40
Pressure psi	2400	3750	6000
Maximum Gap in	0.024	0.020	0.016

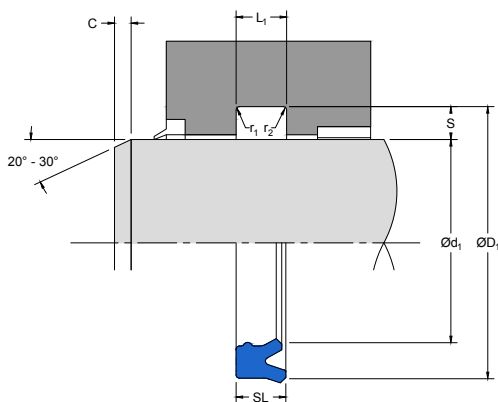
NOTE

Figures show the maximum permissible gap all on one side, for rod seals using minimum rod $\varnothing$ and maximum clearance $\varnothing$ and for piston seals using the minimum clearance $\varnothing$ and maximum bore $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing d_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing D_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII						
Groove Section $< S$ mm	4.00	5.00	7.50	10.00	12.50	15.00
Min Chamfer C mm	3.00	3.50	5.00	6.50	7.00	8.00
Max Fillet Rad r_1 mm	0.20	0.40	0.80	0.80	1.20	1.60
Max Fillet Rad r_2 mm	0.40	0.80	1.20	1.20	1.60	2.40
Groove Section $\leq S$ in	0.125	0.187	0.250	0.312	0.375	0.500
Min Chamfer C in	0.093	0.093	0.125	0.156	0.187	0.187
Max Fillet Rad r_1 in	0.008	0.008	0.016	0.032	0.032	0.032
Max Fillet Rad r_2 in	0.016	0.016	0.032	0.047	0.047	0.047

TOLERANCES	$\varnothing d_1$	$\varnothing D_1$	L_1
mm	f9	Js11	+0.25 -0
in	f9	Js11	+0.010 -0



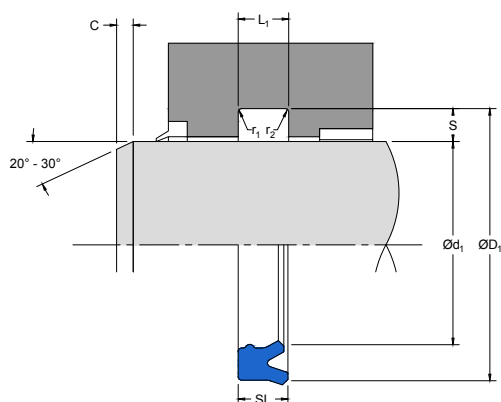
605

ROD SEAL

*Twin Lip
Polyurethane*

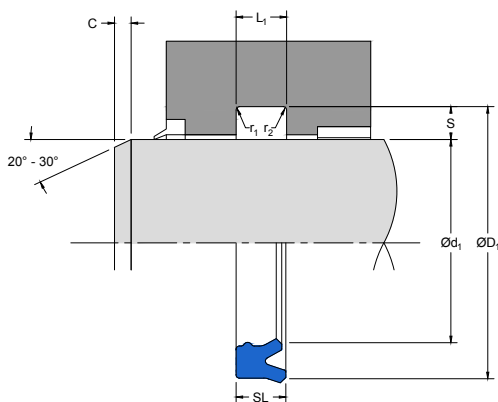
PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
0.375	-0.001 -0.002	0.625	+0.002 -0.002	0.198	0.218	4544300
0.375	-0.001 -0.002	0.750	+0.003 -0.003	0.312	0.344	4710500
0.500	-0.001 -0.002	0.750	+0.003 -0.003	0.187	0.207	4576100
0.562	-0.001 -0.002	0.813	+0.003 -0.003	0.187	0.207	4576200
0.625	-0.001 -0.002	0.875	+0.003 -0.003	0.187	0.207	4493700
0.625	-0.001 -0.002	0.875	+0.003 -0.003	0.241	0.265	4329000
0.625	-0.001 -0.002	1.000	+0.003 -0.003	0.281	0.312	4447200
0.688	-0.001 -0.002	0.938	+0.003 -0.003	0.187	0.207	4572000
0.750	-0.001 -0.003	1.000	+0.003 -0.003	0.125	0.138	4552900
0.750	-0.001 -0.003	1.000	+0.003 -0.003	0.187	0.207	4571000
0.750	-0.001 -0.003	1.000	+0.003 -0.003	0.250	0.275	4345100
0.750	-0.001 -0.003	1.125	+0.003 -0.003	0.312	0.344	4512200
0.813	-0.001 -0.003	1.063	+0.003 -0.003	0.187	0.207	4576300
0.813	-0.001 -0.003	1.063	+0.003 -0.003	0.250	0.275	4558700
0.875	-0.001 -0.003	1.125	+0.003 -0.003	0.187	0.207	4576400
0.875	-0.001 -0.003	1.125	+0.003 -0.003	0.250	0.275	4442500



PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
0.875	-0.001 -0.003	1.250	+0.003 -0.003	0.324	0.356	4794500
0.875	-0.001 -0.003	1.375	+0.003 -0.003	0.341	0.375	4373100
1.000	-0.001 -0.003	1.240	+0.003 -0.003	0.192	0.211	4371800
1.000	-0.001 -0.003	1.250	+0.003 -0.003	0.187	0.207	4442600
1.000	-0.001 -0.003	1.250	+0.003 -0.003	0.250	0.275	4345200
1.000	-0.001 -0.003	1.312	+0.003 -0.003	0.219	0.241	4493800
1.000	-0.001 -0.003	1.375	+0.003 -0.003	0.187	0.207	4801700
1.000	-0.001 -0.003	1.375	+0.003 -0.003	0.250	0.275	4456800
1.000	-0.001 -0.003	1.375	+0.003 -0.003	0.312	0.344	4345900
1.000	-0.001 -0.003	1.500	+0.003 -0.003	0.255	0.275	4430200
1.000	-0.001 -0.003	1.500	+0.003 -0.003	0.341	0.375	4330100
1.000	-0.001 -0.003	1.500	+0.003 -0.003	0.375	0.413	4308400
1.063	-0.001 -0.003	1.302	+0.003 -0.003	0.187	0.207	4410300
1.063	-0.001 -0.003	1.313	+0.003 -0.003	0.250	0.275	4394500
1.125	-0.001 -0.003	1.365	+0.003 -0.003	0.192	0.211	4384500
1.125	-0.001 -0.003	1.375	+0.003 -0.003	0.187	0.207	4442700



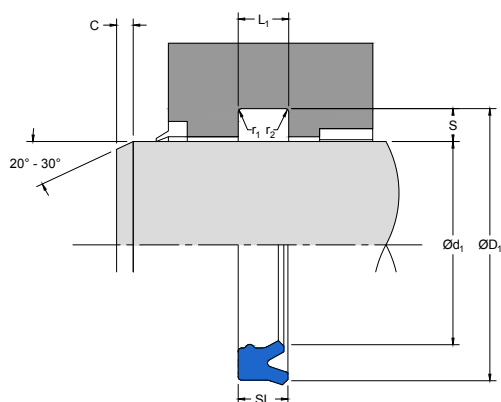
605

ROD SEAL

*Twin Lip
Polyurethane*

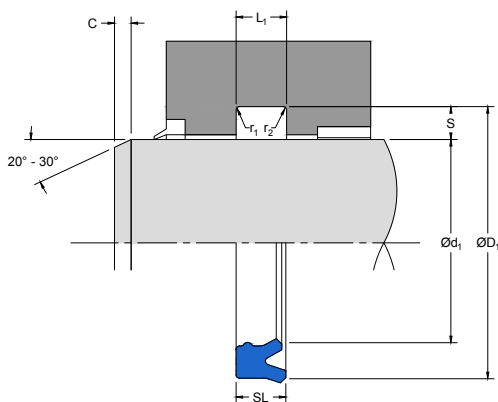
PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
1.125	-0.001 -0.003	1.375	+0.003 -0.003	0.250	0.275	4388000
1.125	-0.001 -0.003	1.399	+0.003 -0.003	0.192	0.211	4371900
1.125	-0.001 -0.003	1.500	+0.003 -0.003	0.312	0.344	4392600
1.125	-0.001 -0.003	1.562	+0.003 -0.003	0.325	0.360	4568800
1.125	-0.001 -0.003	1.625	+0.003 -0.003	0.250	0.275	4370900
1.125	-0.001 -0.003	1.750	+0.003 -0.003	0.397	0.437	4373000
1.187	-0.001 -0.003	1.562	+0.003 -0.003	0.250	0.275	4458600
1.250	-0.001 -0.003	1.500	+0.003 -0.003	0.187	0.207	4359600
1.250	-0.001 -0.003	1.500	+0.003 -0.003	0.250	0.275	4345300
1.250	-0.001 -0.003	1.625	+0.003 -0.003	0.187	0.207	4552600
1.250	-0.001 -0.003	1.625	+0.003 -0.003	0.227	0.250	4330200
1.250	-0.001 -0.003	1.625	+0.003 -0.003	0.250	0.275	4460600
1.250	-0.001 -0.003	1.625	+0.003 -0.003	0.312	0.344	4346000
1.250	-0.001 -0.003	1.750	+0.003 -0.003	0.250	0.275	4513500
1.250	-0.001 -0.003	1.750	+0.003 -0.003	0.375	0.413	4335800
1.250	-0.001 -0.003	1.875	+0.003 -0.003	0.397	0.437	4330300



PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
1.375	-0.001 -0.003	1.625	+0.003 -0.003	0.187	0.207	4392200
1.375	-0.001 -0.003	1.625	+0.003 -0.003	0.250	0.275	4345400
1.375	-0.001 -0.003	1.687	+0.003 -0.003	0.219	0.241	4493900
1.375	-0.001 -0.003	1.750	+0.003 -0.003	0.187	0.207	4552800
1.375	-0.001 -0.003	1.750	+0.003 -0.003	0.312	0.344	4346100
1.375	-0.001 -0.003	1.875	+0.003 -0.003	0.375	0.413	4403100
1.375	-0.001 -0.003	2.000	+0.004 -0.004	0.397	0.437	4330400
1.437	-0.001 -0.003	1.812	+0.003 -0.003	0.312	0.344	4442800
1.500	-0.001 -0.003	1.750	+0.003 -0.003	0.250	0.275	4345500
1.500	-0.001 -0.003	1.875	+0.003 -0.003	0.187	0.207	4576600
1.500	-0.001 -0.003	1.875	+0.003 -0.003	0.250	0.275	4322100
1.500	-0.001 -0.003	1.875	+0.003 -0.003	0.312	0.344	4346200
1.500	-0.001 -0.003	1.875	+0.003 -0.003	0.375	0.413	4385400
1.500	-0.001 -0.003	2.000	+0.004 -0.004	0.250	0.275	4394400
1.500	-0.001 -0.003	2.000	+0.004 -0.004	0.341	0.375	4330500
1.500	-0.001 -0.003	2.000	+0.004 -0.004	0.375	0.413	4322200



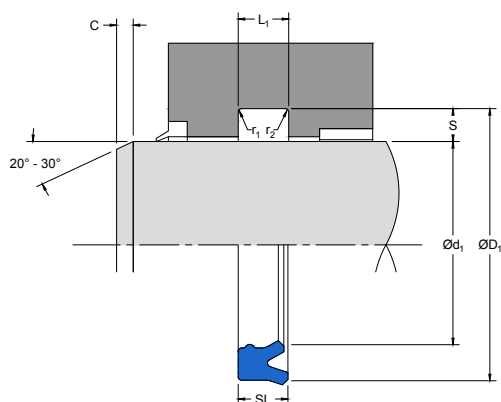
605

ROD SEAL

*Twin Lip
Polyurethane*

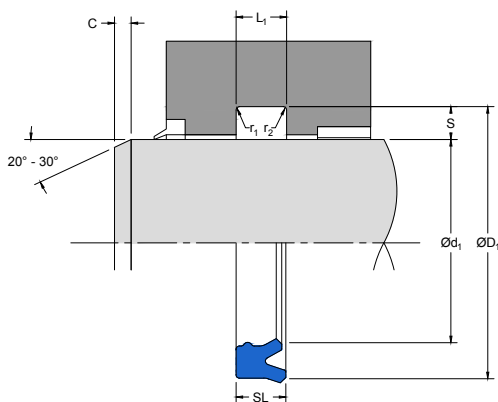
PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
1.500	-0.001 -0.003	2.125	+0.004 -0.004	0.375	0.413	4442900
1.500	-0.001 -0.003	2.125	+0.004 -0.004	0.397	0.437	4330600
1.625	-0.001 -0.003	1.875	+0.003 -0.003	0.250	0.275	4345600
1.625	-0.001 -0.003	2.000	+0.004 -0.004	0.281	0.312	4542800
1.625	-0.001 -0.003	2.000	+0.004 -0.004	0.312	0.344	4443000
1.625	-0.001 -0.003	2.000	+0.004 -0.004	0.375	0.413	4443100
1.625	-0.001 -0.003	2.125	+0.004 -0.004	0.375	0.413	4512100
1.750	-0.001 -0.003	2.000	+0.004 -0.004	0.250	0.275	4345700
1.750	-0.001 -0.003	2.125	+0.004 -0.004	0.250	0.275	4357200
1.750	-0.001 -0.003	2.125	+0.004 -0.004	0.312	0.344	4346300
1.750	-0.001 -0.003	2.125	+0.004 -0.004	0.375	0.413	4366800
1.750	-0.001 -0.003	2.250	+0.004 -0.004	0.250	0.275	4552700
1.750	-0.001 -0.003	2.250	+0.004 -0.004	0.341	0.375	4330700
1.750	-0.001 -0.003	2.250	+0.004 -0.004	0.375	0.413	4337000
1.750	-0.001 -0.003	2.250	+0.004 -0.004	0.500	0.550	4376800
1.750	-0.001 -0.003	2.375	+0.004 -0.004	0.437	0.481	4443200



PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
1.875	-0.001 -0.003	2.250	+0.004 -0.004	0.312	0.344	4834600
1.875	-0.001 -0.003	2.250	+0.004 -0.004	0.375	0.413	4476200
1.875	-0.001 -0.003	2.375	+0.004 -0.004	0.375	0.413	4391200
1.875	-0.001 -0.003	2.500	+0.004 -0.004	0.397	0.437	4331500
2.000	-0.001 -0.004	2.250	+0.004 -0.004	0.250	0.275	4345800
2.000	-0.001 -0.004	2.375	+0.004 -0.004	0.250	0.275	4458700
2.000	-0.001 -0.004	2.375	+0.004 -0.004	0.312	0.344	4346400
2.000	-0.001 -0.004	2.375	+0.004 -0.004	0.375	0.413	4380100
2.000	-0.001 -0.004	2.500	+0.004 -0.004	0.250	0.275	4496900
2.000	-0.001 -0.004	2.500	+0.004 -0.004	0.312	0.344	4382900
2.000	-0.001 -0.004	2.500	+0.004 -0.004	0.341	0.375	4330900
2.000	-0.001 -0.004	2.500	+0.004 -0.004	0.375	0.413	4337100
2.000	-0.001 -0.004	2.500	+0.004 -0.004	0.781	0.859	4491400
2.000	-0.001 -0.004	2.625	+0.004 -0.004	0.312	0.344	4333100
2.000	-0.001 -0.004	2.625	+0.004 -0.004	0.397	0.437	4331000
2.000	-0.001 -0.004	2.625	+0.004 -0.004	0.500	0.550	4346500



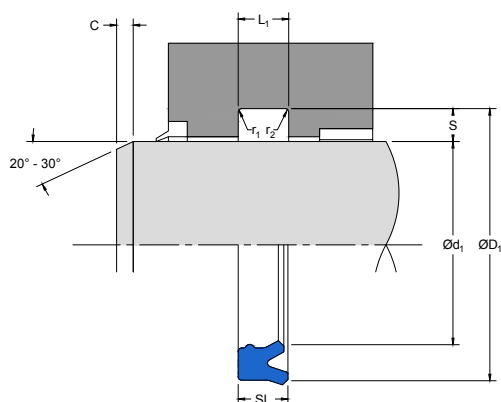
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ROD SEAL

*Twin Lip
Polyurethane*

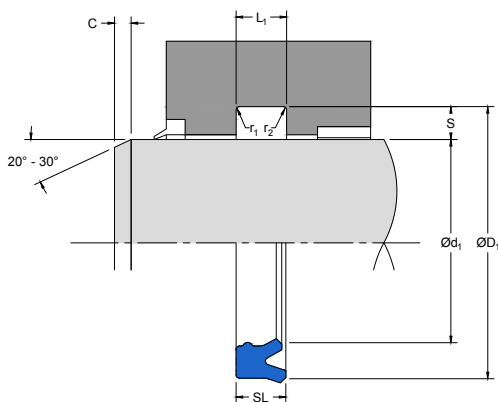
PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
2.000	-0.001 -0.004	2.750	+0.004 -0.004	0.625	0.688	4347300
2.125	-0.001 -0.004	2.500	+0.004 -0.004	0.375	0.413	4443300
2.250	-0.001 -0.004	2.625	+0.004 -0.004	0.335	0.375	4372200
2.250	-0.001 -0.004	2.750	+0.004 -0.004	0.341	0.375	4331100
2.250	-0.001 -0.004	2.750	+0.004 -0.004	0.375	0.413	4337200
2.250	-0.001 -0.004	2.875	+0.004 -0.004	0.500	0.550	4750200
2.250	-0.001 -0.004	3.000	+0.004 -0.004	0.511	0.562	4331200
2.375	-0.001 -0.004	2.750	+0.004 -0.004	0.375	0.413	4443400
2.375	-0.001 -0.004	2.875	+0.004 -0.004	0.375	0.413	4443500
2.500	-0.001 -0.004	2.875	+0.004 -0.004	0.312	0.344	4443600
2.500	-0.001 -0.004	2.875	+0.004 -0.004	0.375	0.413	4458500
2.500	-0.001 -0.004	2.937	+0.004 -0.004	0.284	0.312	4535900
2.500	-0.001 -0.004	3.000	+0.004 -0.004	0.250	0.275	4553000
2.500	-0.001 -0.004	3.000	+0.004 -0.004	0.284	0.312	4331300
2.500	-0.001 -0.004	3.000	+0.004 -0.004	0.375	0.413	4335900
2.500	-0.001 -0.004	3.125	+0.004 -0.004	0.500	0.550	4346600



PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
2.500	-0.001 -0.004	3.250	+0.004 -0.004	0.625	0.688	4347400
2.625	-0.001 -0.004	3.000	+0.004 -0.004	0.375	0.413	4443700
2.625	-0.001 -0.004	3.125	+0.004 -0.004	0.500	0.550	4514900
2.625	-0.001 -0.004	3.250	+0.004 -0.004	0.625	0.688	4376900
2.735	-0.001 -0.004	3.250	+0.004 -0.004	0.312	0.344	4746400
2.750	-0.001 -0.004	3.125	+0.004 -0.004	0.375	0.413	4379100
2.750	-0.001 -0.004	3.250	+0.004 -0.004	0.375	0.413	4336000
2.750	-0.001 -0.004	3.375	+0.004 -0.004	0.375	0.413	4456900
2.750	-0.001 -0.004	3.375	+0.004 -0.004	0.500	0.550	4346700
2.750	-0.001 -0.004	3.375	+0.004 -0.004	0.805	0.885	4467400
2.750	-0.001 -0.004	3.500	+0.004 -0.004	0.625	0.688	4347500
2.875	-0.001 -0.004	3.250	+0.004 -0.004	0.375	0.413	4443800
2.875	-0.001 -0.004	3.375	+0.004 -0.004	0.375	0.413	4760200
3.000	-0.001 -0.004	3.375	+0.004 -0.004	0.375	0.413	4468300
3.000	-0.001 -0.004	3.438	+0.004 -0.004	0.281	0.310	4539900
3.000	-0.001 -0.004	3.500	+0.004 -0.004	0.375	0.413	4336100



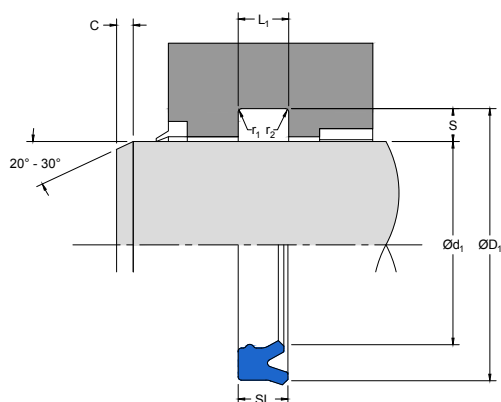
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ROD SEAL

*Twin Lip
Polyurethane*

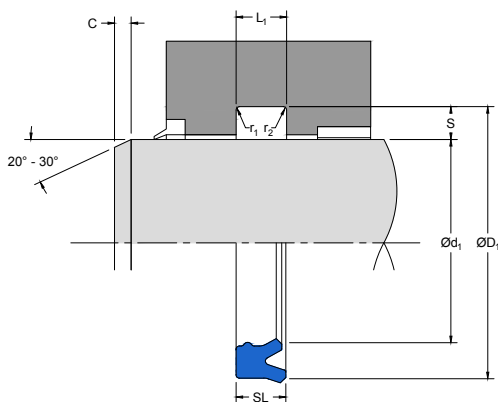
PART NUMBER RANGE

INCH						
Ød ₁	TOL f ₉	ØD ₁	TOL Js ₁₁	SL	L ₁ +0.010-0	PART No.
3.000	-0.001 -0.004	3.500	+0.004 -0.004	0.625	0.688	4399600
3.000	-0.001 -0.004	3.500	+0.004 -0.004	0.781	0.859	4476900
3.000	-0.001 -0.004	3.625	+0.004 -0.004	0.500	0.550	4346800
3.000	-0.001 -0.004	3.750	+0.004 -0.004	0.625	0.688	4347600
3.125	-0.001 -0.004	3.500	+0.004 -0.004	0.625	0.688	4399700
3.250	-0.001 -0.005	3.625	+0.004 -0.004	0.375	0.413	4714100
3.250	-0.001 -0.005	3.625	+0.004 -0.004	0.562	0.619	4476800
3.250	-0.001 -0.005	3.750	+0.004 -0.004	0.375	0.413	4336200
3.250	-0.001 -0.005	3.875	+0.004 -0.004	0.500	0.550	4415400
3.375	-0.001 -0.005	3.875	+0.004 -0.004	0.375	0.413	4760300
3.375	-0.001 -0.005	4.000	+0.004 -0.004	0.594	0.653	4377000
3.500	-0.001 -0.005	3.875	+0.004 -0.004	0.375	0.413	4468400
3.500	-0.001 -0.005	4.000	+0.004 -0.004	0.312	0.344	4540000
3.500	-0.001 -0.005	4.000	+0.004 -0.004	0.375	0.413	4336300
3.500	-0.001 -0.005	4.125	+0.004 -0.004	0.500	0.550	4346900
3.500	-0.001 -0.005	4.250	+0.004 -0.004	0.625	0.688	4347700



PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
3.625	-0.001 -0.005	4.125	+0.004 -0.004	0.375	0.413	4436200
3.750	-0.001 -0.005	4.125	+0.004 -0.004	0.375	0.413	4702500
3.750	-0.001 -0.005	4.250	+0.004 -0.004	0.375	0.413	4443900
3.750	-0.001 -0.005	4.250	+0.004 -0.004	0.500	0.550	4456500
3.750	-0.001 -0.005	4.250	+0.004 -0.004	0.562	0.625	4436100
3.875	-0.001 -0.005	4.375	+0.004 -0.004	0.375	0.413	4760400
4.000	-0.001 -0.005	4.375	+0.004 -0.004	0.375	0.413	4468500
4.000	-0.001 -0.005	4.500	+0.004 -0.004	0.312	0.344	4586700
4.000	-0.001 -0.005	4.500	+0.004 -0.004	0.375	0.413	4336400
4.000	-0.001 -0.005	4.500	+0.004 -0.004	0.562	0.619	4385700
4.000	-0.001 -0.005	4.500	+0.004 -0.004	0.781	0.859	4399800
4.000	-0.001 -0.005	4.625	+0.004 -0.004	0.375	0.413	4520100
4.000	-0.001 -0.005	4.625	+0.004 -0.004	0.500	0.550	4347000
4.000	-0.001 -0.005	4.750	+0.005 -0.005	0.500	0.550	4444000
4.000	-0.001 -0.005	4.750	+0.005 -0.005	0.625	0.688	4347800
4.250	-0.001 -0.005	5.000	+0.005 -0.005	0.625	0.688	4347900



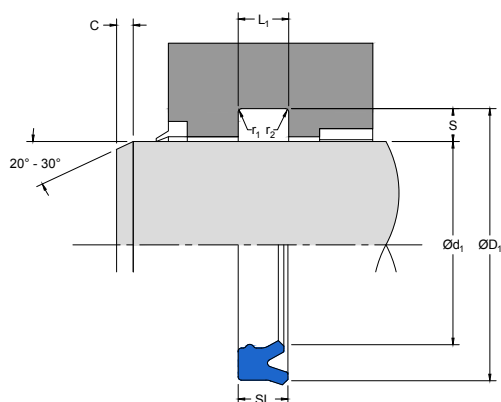
605

ROD SEAL

*Twin Lip
Polyurethane*

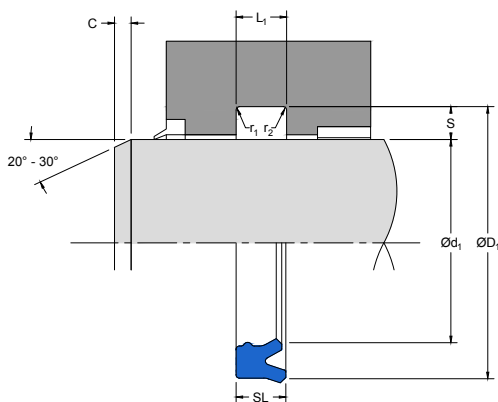
PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
4.375	-0.001 -0.005	4.875	+0.005 -0.005	0.375	0.413	4760500
4.500	-0.001 -0.005	5.000	+0.005 -0.005	0.375	0.413	4379200
4.500	-0.001 -0.005	5.125	+0.005 -0.005	0.500	0.550	4347100
4.500	-0.001 -0.005	5.125	+0.005 -0.005	0.625	0.688	4444100
4.500	-0.001 -0.005	5.250	+0.005 -0.005	0.625	0.688	4348000
4.625	-0.001 -0.005	5.250	+0.005 -0.005	0.625	0.688	4377100
4.750	-0.002 -0.006	5.125	+0.005 -0.005	0.375	0.413	4714200
4.750	-0.002 -0.006	5.250	+0.005 -0.005	0.625	0.688	4451100
4.875	-0.002 -0.006	5.375	+0.005 -0.005	0.375	0.413	4760600
5.000	-0.002 -0.006	5.500	+0.005 -0.005	0.375	0.413	4495000
5.000	-0.002 -0.006	5.500	+0.005 -0.005	0.562	0.619	4386100
5.000	-0.002 -0.006	5.500	+0.005 -0.005	0.781	0.859	4399900
5.000	-0.002 -0.006	5.531	+0.005 -0.005	0.557	0.619	4391400
5.000	-0.002 -0.006	5.625	+0.005 -0.005	0.500	0.550	4347200
5.000	-0.002 -0.006	5.750	+0.005 -0.005	0.625	0.688	4348100
5.125	-0.002 -0.006	5.625	+0.005 -0.005	0.562	0.619	4436000



PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
5.125	-0.002 -0.006	6.000	+0.005 -0.005	0.500	0.550	4444200
5.375	-0.002 -0.006	5.875	+0.005 -0.005	0.625	0.688	4475800
5.375	-0.002 -0.006	6.000	+0.005 -0.005	0.625	0.688	4448300
5.500	-0.002 -0.006	6.000	+0.005 -0.005	0.375	0.413	4379300
5.500	-0.002 -0.006	6.000	+0.005 -0.005	0.562	0.619	4468600
5.500	-0.002 -0.006	6.125	+0.005 -0.005	0.312	0.344	4540100
5.500	-0.002 -0.006	6.250	+0.005 -0.005	0.625	0.688	4348200
5.625	-0.002 -0.006	6.125	+0.005 -0.005	0.375	0.413	4714300
6.000	-0.002 -0.006	6.500	+0.005 -0.005	0.562	0.619	4436500
6.000	-0.002 -0.006	6.500	+0.005 -0.005	0.781	0.859	4400000
6.000	-0.002 -0.006	6.531	+0.005 -0.005	0.562	0.619	4391000
6.000	-0.002 -0.006	6.750	+0.005 -0.005	0.625	0.688	4348300
6.500	-0.002 -0.006	7.250	+0.006 -0.006	0.625	0.688	4348400
7.000	-0.002 -0.006	7.500	+0.006 -0.006	0.562	0.619	4436600
7.000	-0.002 -0.006	7.500	+0.006 -0.006	0.780	0.859	4456600
7.000	-0.002 -0.006	7.531	+0.006 -0.006	0.562	0.619	4391100



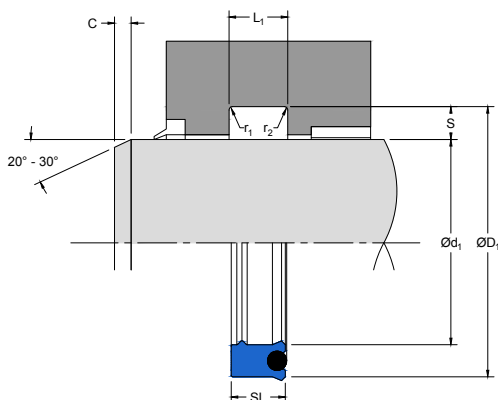
605

ROD SEAL

*Twin Lip
Polyurethane*

PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
7.000	-0.002 -0.006	7.750	+0.006 -0.006	0.625	0.688	4348500
7.500	-0.002 -0.006	8.000	+0.006 -0.006	0.375	0.413	4714400
7.750	-0.002 -0.006	8.500	+0.006 -0.006	0.625	0.688	4353900
8.000	-0.002 -0.006	8.500	+0.006 -0.006	0.375	0.413	4733400
8.000	-0.002 -0.006	8.500	+0.006 -0.006	0.562	0.619	4468700
8.000	-0.002 -0.006	8.750	+0.006 -0.006	0.625	0.688	4510500
8.125	-0.002 -0.006	8.625	+0.006 -0.006	0.781	0.859	4477000
8.500	-0.002 -0.006	9.000	+0.006 -0.006	0.375	0.413	4733500
9.000	-0.002 -0.006	9.500	+0.006 -0.006	0.562	0.619	4468800
9.250	-0.002 -0.006	10.000	+0.006 -0.006	0.625	0.688	4499300
9.375	-0.002 -0.006	9.875	+0.006 -0.006	0.781	0.859	4477100
9.750	-0.002 -0.006	10.250	+0.006 -0.006	0.375	0.413	4733600
10.000	-0.002 -0.007	10.500	+0.006 -0.006	0.562	0.619	4468900



620

ROD SEAL

Twin Lip

Polyurethane with O-Ring Energizer

DESIGN

The Hallite 620 is a twin lip rod seal designed with precision trimmed sealing lips to provide a dry sealing solution in light and medium-duty application. The seal is manufactured in a polyurethane shell energized by a high quality O-ring. The sealing lips are trimmed at an angle to give optimal rod sealing performance.

Like the Hallite 621 rod seal, the Hallite 620 is designed to have an interference in the seal housing groove and a secondary lip. The secondary sealing lip located behind the primary sealing lip improves stability of the seal in the gland. At zero or low pressure, the O-ring helps to increase the sealing force preventing any bypass. Under most conditions as the pressure rises, the sealing force increases and the O-ring ensures complete lip actuation. Together these features result in improved life and sealing.

In rod applications, the Hallite 620 provides a twin lip alternative to Hallite's 511, 512, and particularly the 513 rod/piston seals.

The Hallite 620's seal shell is molded in Hythane® 181, Hallite's high-performance polyurethane, for easy installation and excellent low temperature performance. The Hallite 620 is also offered in other high quality Hythane® materials to match the needs of the application.



FEATURES

- Low temperature capabilities
- Improved shock handling
- Low friction
- Increased seal stability
- Primary lip protection
- Easy to install

MATERIALS

As standard, this product comes in the following materials. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Shell Type	Shell Color
Standard	Hythane® 181-NBR	TPU-EU	Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-45°C +110°C	-50°F +230°F
Maximum Pressure	400 bar	6000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

MAXIMUM EXTRUSION GAP			
Pressure bar	160	250	400
Maximum Gap mm	0.60	0.50	0.40
Pressure psi	2400	3750	6000
Maximum Gap in	0.024	0.020	0.016

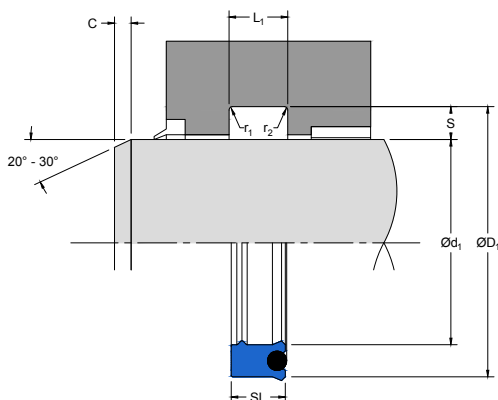
NOTE

Figures show the maximum permissible gap all on one side using minimum rod $\varnothing$ and maximum clearance $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing d_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing D_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

RADII		
Groove Section $\leq S$ in	0.125	0.187
Min Chamfer C in	0.093	0.093
Max Fillet Rad r_1 in	0.008	0.008
Max Fillet Rad r_2 in	0.016	0.016

TOLERANCES	$\varnothing D_1$	$\varnothing d_1$	L_1
in	f9	Js11	+0.010 -0



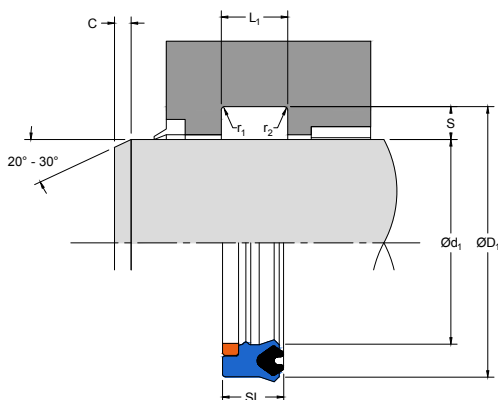
620

ROD SEAL

*Twin Lip
Polyurethane with O-Ring Energizer*

PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
0.625	-0.001 -0.002	0.875	+0.003 -0.003	0.160	0.176	4498600
0.625	-0.001 -0.002	0.875	+0.003 -0.003	0.175	0.190	4528700
0.625	-0.001 -0.002	0.875	+0.003 -0.003	0.250	0.275	4459900
0.750	-0.001 -0.003	1.000	+0.003 -0.003	0.187	0.207	4583900
0.750	-0.001 -0.003	1.000	+0.003 -0.003	0.250	0.275	4498500
0.875	-0.001 -0.003	1.125	+0.003 -0.003	0.187	0.207	4709100
1.000	-0.001 -0.003	1.240	+0.003 -0.003	0.187	0.217	4477200
1.000	-0.001 -0.003	1.250	+0.003 -0.003	0.187	0.197	4457500
1.000	-0.001 -0.003	1.250	+0.003 -0.003	0.250	0.275	4498400
1.000	-0.001 -0.003	1.375	+0.003 -0.003	0.250	0.275	4410400
1.000	-0.001 -0.003	1.375	+0.003 -0.003	0.312	0.344	4584000
1.125	-0.001 -0.003	1.375	+0.003 -0.003	0.250	0.275	4461100
1.125	-0.001 -0.003	1.500	+0.003 -0.003	0.250	0.275	4410500
1.250	-0.001 -0.003	1.500	+0.003 -0.003	0.187	0.207	4398900
1.250	-0.001 -0.003	1.500	+0.003 -0.003	0.250	0.275	4461000
1.250	-0.001 -0.003	1.625	+0.003 -0.003	0.312	0.344	4410600
1.375	-0.001 -0.003	1.750	+0.003 -0.003	0.312	0.344	4410700
1.500	-0.001 -0.003	1.875	+0.003 -0.003	0.375	0.413	4750600
1.750	-0.001 -0.003	2.125	+0.004 -0.004	0.375	0.413	4460000
2.000	-0.001 -0.004	2.500	+0.004 -0.004	0.250	0.275	8907600



621

ROD SEAL

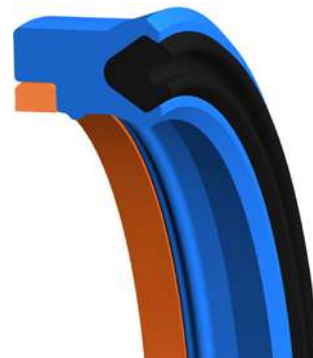
*Twin Lip
Polyurethane with AE Ring and Profiled
Rubber Energizer for Heavy Duty Applications*

DESIGN

The Hallite 621 is a top-of-the-range twin lip rod seal designed to provide a dry sealing solution in heavy-duty applications.

The secondary sealing lip located behind the primary sealing lip improves stability of the seal in the gland. The unique profile of the NBR energiser ensures the precision trimmed primary sealing lips maintain contact under low or no pressure situations while ensuring proper sealing at higher pressures. This unique profile is also used in the Hallite 622 twin lip rod seal. The Hallite 621 also incorporates an acetyl anti-extrusion ring to withstand side loads and extreme pressure peaks even with the extrusion gaps, which are the result of using remote plastic bearing strips like the Hallite 506 or 708.

The Hallite 621's seal shell is molded in Hythane® 181, Hallite's high-performance polyurethane, for easy installation and excellent low temperature performance.



FEATURES

- High pressure and shock load capability
- Increased seal stability
- Low temperature capabilities
- Primary lip protection
- Low friction
- Easy to install

MATERIALS

As standard, this product comes in the following materials. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Shell Type	Shell Color
Standard	Hythane® 181-NBR-POM 0011	TPU-EU	Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-45°C +110°C	-50°F +230°F
Maximum Pressure	700 bar	10000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

MAXIMUM EXTRUSION GAP					
Pressure bar	160	250	400	500	700
Maximum Gap mm	0.60	0.50	0.60	0.40	0.25
Pressure psi	2400	3750	6000	7500	10000
Maximum Gap in	0.024	0.020	0.024	0.016	0.010

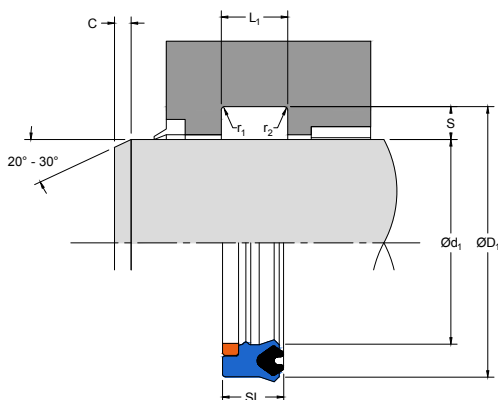
NOTE

Figures show the maximum permissible gap all on one side, for rod seals using minimum rod $\varnothing$ and maximum clearance $\varnothing$ and for piston seals using the minimum clearance $\varnothing$ and maximum bore $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing d_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing D_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII						
Groove Section $<S$ mm	4.00	5.00	7.50	10.00	12.50	15.00
Min Chamfer C mm	3.00	3.50	5.00	6.50	7.00	8.00
Max Fillet Rad r_1 mm	0.20	0.40	0.80	0.80	2.30	1.60
Max Fillet Rad r_2 mm	0.400	0.800	1.200	1.60	1.60	2.40
Groove Section $<S$ in	0.125	0.187	0.250	0.312	0.375	0.500
Min Chamfer C in	0.093	0.093	0.125	0.156	0.187	0.217
Max Fillet Rad r_1 in	0.008	0.008	0.016	0.016	0.032	0.032
Max Fillet Rad r_2 in	0.016	0.016	0.032	0.032	0.047	0.047

TOLERANCES	$\varnothing d_1$	$\varnothing D_1$	L_1
mm	f9	Js11	+0.25 -0
in	f9	Js11	+0.010 -0



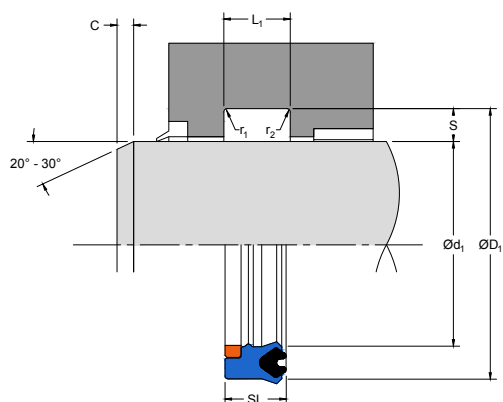
621

ROD SEAL

*Twin Lip
Polyurethane with AE Ring and Profiled
Rubber Energiser for Heavy Duty Applications*

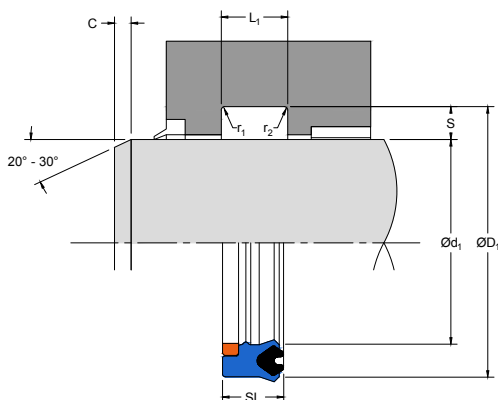
PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
1.250	-0.001 -0.003	1.625	+0.003 -0.003	0.250	0.275	4794110
1.250	-0.001 -0.003	1.625	+0.003 -0.003	0.313	0.344	4809910
1.375	-0.001 -0.003	1.875	+0.003 -0.003	0.375	0.413	4707710
1.500	-0.001 -0.003	1.875	+0.003 -0.003	0.250	0.275	4484410
1.500	-0.001 -0.003	1.875	+0.003 -0.003	0.312	0.344	4484510
1.500	-0.001 -0.003	2.000	+0.004 -0.004	0.375	0.413	4484910
1.750	-0.001 -0.003	2.125	+0.004 -0.004	0.250	0.275	4484610
1.750	-0.001 -0.003	2.125	+0.004 -0.004	0.375	0.413	4484710
1.750	-0.001 -0.003	2.250	+0.004 -0.004	0.375	0.413	4485010
2.000	-0.001 -0.004	2.375	+0.004 -0.004	0.375	0.413	4484810
2.000	-0.001 -0.004	2.500	+0.004 -0.004	0.375	0.413	4485110
2.125	-0.001 -0.004	2.625	+0.004 -0.004	0.375	0.413	4592510
2.250	-0.001 -0.004	2.750	+0.004 -0.004	0.375	0.413	4485210
2.375	-0.001 -0.004	2.875	+0.004 -0.004	0.375	0.413	4485310
2.500	-0.001 -0.004	3.000	+0.004 -0.004	0.375	0.413	4485410
2.500	-0.001 -0.004	3.125	+0.004 -0.004	0.500	0.550	4794310



PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
2.750	-0.001 -0.004	3.250	+0.004 -0.004	0.375	0.413	4485510
3.000	-0.001 -0.004	3.500	+0.004 -0.004	0.375	0.413	4485610
3.000	-0.001 -0.004	3.625	+0.004 -0.004	0.500	0.550	4486810
3.000	-0.001 -0.004	3.750	+0.004 -0.004	0.625	0.688	4489310
3.250	-0.001 -0.005	3.750	+0.004 -0.004	0.375	0.413	4485710
3.250	-0.001 -0.005	4.000	+0.004 -0.004	0.625	0.688	4790710
3.500	-0.001 -0.005	4.000	+0.004 -0.004	0.375	0.413	4485810
3.500	-0.001 -0.005	4.125	+0.004 -0.004	0.500	0.550	4486910
3.500	-0.001 -0.005	4.250	+0.004 -0.004	0.625	0.688	4573610
3.750	-0.001 -0.005	4.125	+0.004 -0.004	0.375	0.413	4709310
3.750	-0.001 -0.005	4.250	+0.004 -0.004	0.375	0.413	4790810
4.000	-0.001 -0.005	4.500	+0.004 -0.004	0.375	0.413	4486010
4.000	-0.001 -0.005	4.500	+0.004 -0.004	0.562	0.619	4486110
4.000	-0.001 -0.005	4.625	+0.004 -0.004	0.375	0.413	4778610
4.000	-0.001 -0.005	4.625	+0.004 -0.004	0.500	0.550	4792610
4.000	-0.001 -0.005	4.625	+0.004 -0.004	0.562	0.619	4487010



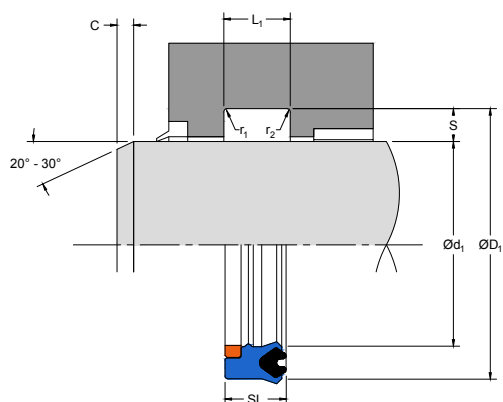
621

ROD SEAL

*Twin Lip
Polyurethane with AE Ring and Profiled
Rubber Energiser for Heavy Duty Applications*

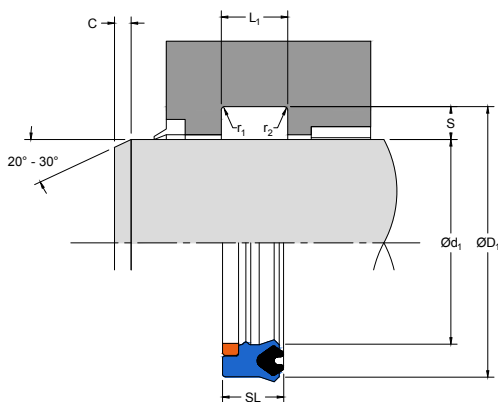
PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
4.000	-0.001 -0.005	4.750	+0.005 -0.005	0.625	0.688	4483310
4.250	-0.001 -0.005	5.000	+0.005 -0.005	0.625	0.688	4790910
4.500	-0.001 -0.005	5.000	+0.005 -0.005	0.375	0.413	4486210
4.500	-0.001 -0.005	5.000	+0.005 -0.005	0.562	0.619	4486310
4.500	-0.001 -0.005	5.125	+0.005 -0.005	0.375	0.413	4791010
4.500	-0.001 -0.005	5.125	+0.005 -0.005	0.625	0.688	4486410
4.500	-0.001 -0.005	5.250	+0.005 -0.005	0.625	0.688	4483410
4.750	-0.002 -0.006	5.500	+0.005 -0.005	0.375	0.413	4791210
4.750	-0.002 -0.006	5.500	+0.005 -0.005	0.625	0.688	4791110
5.000	-0.002 -0.006	5.500	+0.005 -0.005	0.562	0.619	4486510
5.000	-0.002 -0.006	5.625	+0.005 -0.005	0.625	0.688	4487110
5.000	-0.002 -0.006	5.750	+0.005 -0.005	0.625	0.688	4483510
5.250	-0.002 -0.006	6.000	+0.005 -0.005	0.625	0.688	4791310
5.500	-0.002 -0.006	6.000	+0.005 -0.005	0.562	0.619	4486610
5.500	-0.002 -0.006	6.125	+0.005 -0.005	0.375	0.413	4791410
5.750	-0.002 -0.006	6.500	+0.005 -0.005	0.625	0.688	4791510



PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
6.000	-0.002 -0.006	6.500	+0.005 -0.005	0.562	0.619	4486710
6.000	-0.002 -0.006	6.750	+0.005 -0.005	0.625	0.688	4487210
6.250	-0.002 -0.006	7.000	+0.005 -0.005	0.625	0.688	4791610
6.500	-0.002 -0.006	7.250	+0.006 -0.006	0.500	0.550	4791710
6.750	-0.002 -0.006	7.250	+0.006 -0.006	0.562	0.619	4791810
7.000	-0.002 -0.006	7.500	+0.006 -0.006	0.500	0.550	4791910
7.000	-0.002 -0.006	7.625	+0.006 -0.006	0.562	0.619	4792310
7.000	-0.002 -0.006	7.750	+0.006 -0.006	0.562	0.619	4792710
7.000	-0.002 -0.006	7.750	+0.006 -0.006	0.625	0.688	4588210
8.000	-0.002 -0.006	8.500	+0.006 -0.006	0.562	0.619	4792110
8.000	-0.002 -0.006	8.750	+0.006 -0.006	0.625	0.688	4573210
8.500	-0.002 -0.006	9.250	+0.006 -0.006	0.625	0.688	4745010
9.000	-0.002 -0.006	9.750	+0.006 -0.006	0.625	0.688	4808810
9.000	-0.002 -0.006	10.000	+0.006 -0.006	0.750	0.825	4809810
10.000	-0.002 -0.007	10.500	+0.006 -0.006	0.562	0.619	4792210
10.000	-0.002 -0.007	10.750	+0.006 -0.006	0.625	0.688	4808910



621

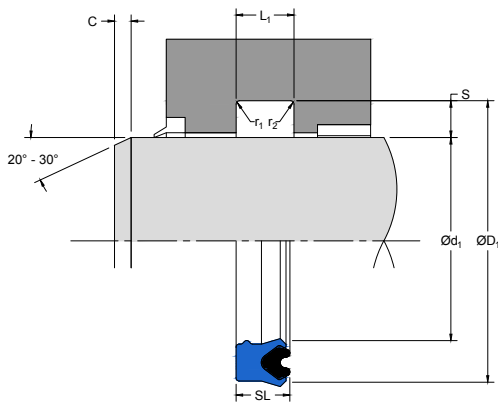
ROD SEAL

Twin Lip

Polyurethane with AE Ring and Profiled Rubber Energiser for Heavy Duty Applications

PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
10.000	-0.002 -0.007	11.000	+0.006 -0.006	0.750	0.825	4809410
10.500	-0.002 -0.007	11.125	+0.006 -0.006	0.562	0.619	4792410
11.000	-0.002 -0.007	11.750	+0.006 -0.006	0.625	0.688	4809210
12.000	-0.002 -0.007	12.750	+0.007 -0.007	0.625	0.688	4809310
12.000	-0.002 -0.007	13.000	+0.007 -0.007	0.750	0.825	4809510
13.000	-0.003 -0.008	13.625	+0.007 -0.007	0.562	0.619	4792510
14.000	-0.003 -0.008	15.000	+0.007 -0.007	0.750	0.825	4809610
15.000	-0.003 -0.008	16.000	+0.008 -0.008	0.750	0.825	4809710



622

ROD SEAL

*Twin Lip
Polyurethane with Profiled Rubber Energizer*

DESIGN

The Hallite 622 is a top-of-the-range twin lip rod seal designed to provide a dry sealing solution in light and medium-duty applications.

The secondary sealing lip located behind the primary sealing lip improves stability of the seal in the gland. The unique profile of the NBR energizer ensures the precision trimmed primary sealing lips maintain contact under low or no pressure situations while ensuring proper sealing at higher pressures.

This unique profile is also used in the Hallite 621 twin lip rod seal. In rod applications, the Hallite 622 provides a twin lip alternative to the Hallite 500 Series (Hallite 511, 512, 513), in particular the Hallite 513 rod/piston seal range.

The Hallite 622's seal shell is molded in Hythane® 181, Hallite's high-performance polyurethane, for easy installation and excellent low temperature performance. The Hallite 622 is also offered in other high quality Hythane® materials to match the needs of the application.



FEATURES

- Low temperature capabilities
- Improved shock handling
- Low friction
- Increased seal stability
- Primary lip protection
- Easy to install

MATERIALS

As standard, this product comes in the following materials. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Shell Type	Shell Color
Standard	Hythane® 181-NBR	TPU-EU	Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-45°C +110°C	-50°F +230°F
Maximum Pressure	400 bar	6000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

MAXIMUM EXTRUSION GAP			
Pressure bar	160	250	400
Maximum Gap mm	0.60	0.50	0.40
Pressure psi	2400	3750	6000
Maximum Gap in	0.024	0.020	0.016

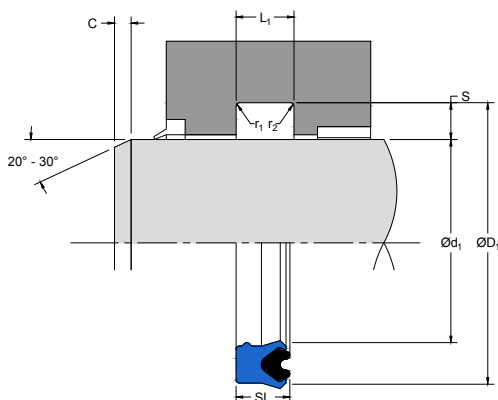
NOTE

Figures show the maximum permissible gap all on one side using minimum rod $\varnothing$ and maximum clearance $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing d_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing D_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII						
Groove Section $\leq S$ mm	4.00	5.00	7.50	10.00	12.50	15.00
Min Chamfer C mm	3.00	3.50	5.00	6.50	7.00	8.00
Max Fillet Rad r_1 mm	0.20	0.40	0.80	0.80	1.20	1.60
Max Fillet Rad r_2 mm	0.40	0.80	1.20	1.20	1.60	2.40
Groove Section $\leq S$ in	0.125	0.187	0.250	0.312	0.375	0.500
Min Chamfer C in	0.093	0.093	0.125	0.156	0.187	0.217
Max Fillet Rad r_1 in	0.008	0.008	0.016	0.032	0.032	0.032
Max Fillet Rad r_2 in	0.016	0.016	0.032	0.047	0.047	0.047

TOLERANCES	$\varnothing D_1$	$\varnothing d_1$	L_1
mm	f9	Js11	+0.25 -0
in	f9	Js11	+0.010 -0



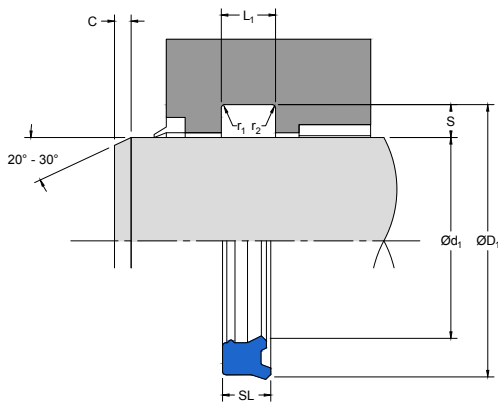
622

ROD SEAL

*Twin Lip
Polyurethane with Profiled Rubber Energizer*

PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
1.500	-0.001 -0.003	1.875	+0.003 -0.003	0.312	0.344	8904010
1.500	-0.001 -0.003	2.000	+0.004 -0.004	0.375	0.413	8904110
1.750	-0.001 -0.003	2.125	+0.004 -0.004	0.375	0.413	8904210
1.750	-0.001 -0.003	2.250	+0.004 -0.004	0.375	0.413	8904310
2.000	-0.001 -0.004	2.500	+0.004 -0.004	0.375	0.413	8904410
2.250	-0.001 -0.004	2.750	+0.004 -0.004	0.375	0.413	8906310
2.500	-0.001 -0.004	3.000	+0.004 -0.004	0.375	0.413	8904510
2.750	-0.001 -0.004	3.250	+0.004 -0.004	0.375	0.413	8904910
3.000	-0.001 -0.004	3.500	+0.004 -0.004	0.375	0.413	8906410
3.500	-0.001 -0.005	4.000	+0.004 -0.004	0.375	0.413	8905010
4.000	-0.001 -0.005	4.500	+0.004 -0.004	0.375	0.413	8906510
4.500	-0.001 -0.005	5.000	+0.005 -0.005	0.375	0.413	8906610



658

ROD SEAL

*Twin Lip
Polyurethane*

DESIGN

The Hallite 658 asymmetric twin lip rod seal designed to provide a dry sealing solution in light and medium-duty applications.

The secondary sealing lip located behind the primary sealing lip improves stability of the seal in the gland. The Hallite 658 is designed to replace an O-ring and one backup sealing arrangement and offer a much higher level of sealing performance and durability without having to change the seal groove.

The Hallite 658 is molded in Hythane® 181, Hallite's high-performance polyurethane, for easy installation and excellent low temperature performance. The Hallite 658 is also offered in other high quality Hythane® materials to match the needs of the application.



FEATURES

- Replaces O-ring and backup in same groove
- Low friction
- Improved sealing
- Increased seal stability
- Primary lip protection
- Easy to install

MATERIALS

As standard, this product comes in the following material. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color
Standard	Hythane® 181	TPU-EU	Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-45°C +110°C	-50°F +230°F
Maximum Pressure	400 bar	6000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

MAXIMUM EXTRUSION GAP			
Pressure bar	160	250	400
Maximum Gap mm	0.60	0.50	0.40
Pressure psi	2400	3750	6000
Maximum Gap in	0.024	0.020	0.016

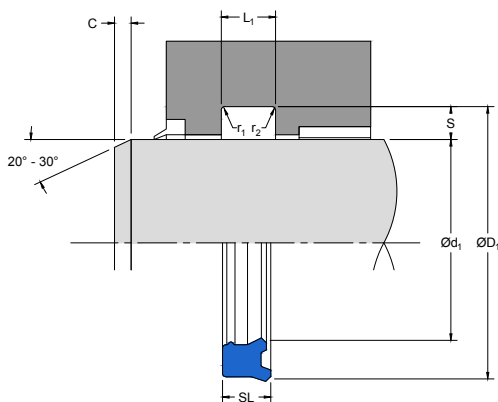
NOTE

Figures show the maximum permissible gap all on one side using minimum rod $\varnothing$ and maximum clearance $\varnothing$. Refer to Housing Design section.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing d_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing D_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII			
Groove Section $\leq S$ in	0.125	0.187	0.250
Min Chamfer C in	0.093	0.093	0.125
Max Fillet Rad r_1 in	0.008	0.008	0.016
Max Fillet Rad r_2 in	0.016	0.016	0.032

TOLERANCES	$\varnothing D_1$	$\varnothing d_1$	L_1
in	f9	Js11	+0.010 -0



658

ROD SEAL

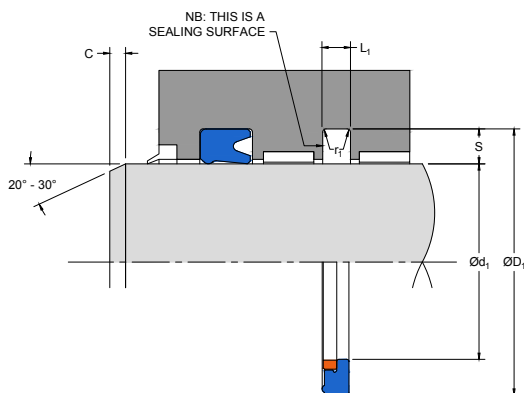
*Twin Lip
Polyurethane*

PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
0.750	-0.001 -0.003	0.937	+0.003 -0.003	0.156	0.172	4472400
0.875	-0.001 -0.003	1.125	+0.003 -0.003	0.187	0.207	4527500
1.000	-0.001 -0.003	1.250	+0.003 -0.003	0.187	0.207	4569000
1.062	-0.001 -0.003	1.302	+0.003 -0.003	0.187	0.207	4549400
1.125	-0.001 -0.003	1.367	+0.003 -0.003	0.187	0.207	4466200
1.250	-0.001 -0.003	1.490	+0.003 -0.003	0.197	0.217	4359610
1.250	-0.001 -0.003	1.625	+0.003 -0.003	0.375	0.413	4747600
1.375	-0.001 -0.003	1.615	+0.003 -0.003	0.197	0.217	4392210
1.375	-0.001 -0.003	1.750	+0.003 -0.003	0.375	0.413	4747700
1.500	-0.001 -0.003	1.740	+0.003 -0.003	0.187	0.207	4480600
1.500	-0.001 -0.003	1.875	+0.003 -0.003	0.295	0.324	4386020
1.500	-0.001 -0.003	1.875	+0.003 -0.003	0.375	0.413	4747800
1.750	-0.001 -0.003	2.118	+0.004 -0.004	0.283	0.311	4456200
1.875	-0.001 -0.003	2.246	+0.004 -0.004	0.281	0.311	4576700
2.000	-0.001 -0.004	2.370	+0.004 -0.004	0.281	0.311	4466300
2.500	-0.001 -0.004	2.871	+0.004 -0.004	0.281	0.311	4576800



ROD BUFFER SEALS



653

ROD BUFFER SEAL

*Single-Acting
Polyurethane with AE Ring*

DESIGN

The Hallite 653 single-acting rod buffer seal is designed to be used in conjunction with a high-performance rod seal, such as the Hallite 605 and 621, to protect the primary seal from shock pressure loading and high frequency pressure spikes in the hydraulic system. The design allows oil to pass through to the rod seal while holding back pressure spikes. The Hallite 653 is a patented product (European patent no. 0427554B1; U.S.A. patent no. 5088747) that also allows pressure to pass back into the system preventing a pressure trap between the rod seal and the buffer seal. The Hallite 653 is an excellent pressure buffer option in heavy-duty applications and offers extended sealing system life and performance.

The Hallite 653 is also interchangeable with common PTFE buffer seal housings.

The Hallite 653 is molded in Hythane® 181, Hallite's high-performance polyurethane, for easy installation and excellent low temperature performance. The Hallite 653 is also offered in a number of other high-performance polyurethanes, such as the Hythane® 361.

The design also incorporates a polyacetyl anti-extrusion ring to provide maximum extrusion resistance against shock pressure loads.



FEATURES

- Prevents inter-seal pressure build up
- Interchangeable with common PTFE buffer seal housings
- Excellent temperature range
- Long seal life
- Easy to install

MATERIALS

This product comes in a number of material options to extend operating conditions. Contact your local Hallite technical team to decide which is best for your application. Use the part designator in the table below as the last digit of the part number to specify material choice when ordering. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Seal Type	Seal Color	Part Designator
Standard	Hythane® 181-POM	TPU-EU	Blue	0
Optional	Hythane® 361-POM	TPU-AU	Orange	6



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-45°C +110°C	-50°F +230°F
Maximum Pressure	700 bar	10000 psi

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

MAXIMUM EXTRUSION GAP					
Pressure bar	160	250	400	500	700
Maximum Gap (S≤6 mm)	0.60	0.50	0.40	0.30	0.20
Maximum Gap (S>6 mm)	1.00	0.80	0.60	0.40	0.25
Pressure psi	2400	3750	6000	7500	10000
Maximum Gap (S≤0.250 in)	0.024	0.020	0.016	0.012	0.008
Maximum Gap (S>0.250 in)	0.040	0.032	0.024	0.016	0.010

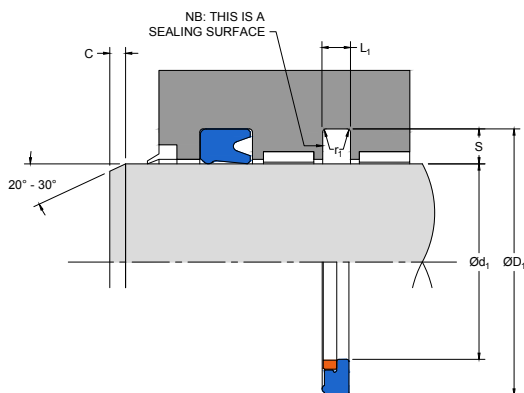
NOTE

Figures show the maximum permissible gap all on one side, for rod seals using minimum rod Ø and maximum clearance Ø and for piston seals using the minimum clearance Ø and maximum bore Ø. Refer to Housing Design section.

SURFACE ROUGHNESS	µmRa	µmRz	µmRt	µinRa	µinRz	µinRt
Dynamic Sealing Face Ød ₁	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face L ₁	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces ØD ₁ , L ₁	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII				
Groove Section <S mm	3.75	5.50	7.75	10.50
Min Chamfer C mm	3.00	3.50	5.00	7.50
Max Fillet Rad r ₁ mm	0.50	0.70	1.20	1.60
Groove Section <S in	0.150	0.215	0.306	0.413
Min Chamfer C in	0.125	0.140	0.200	0.300
Max Fillet Rad r ₁ in	0.020	0.028	0.047	0.062

TOLERANCES	Ød ₁	ØD ₁	L ₁
mm	f9	H10	+0.25 -0
in	f9	Js11	+0.010 -0



653

ROD BUFFER SEAL

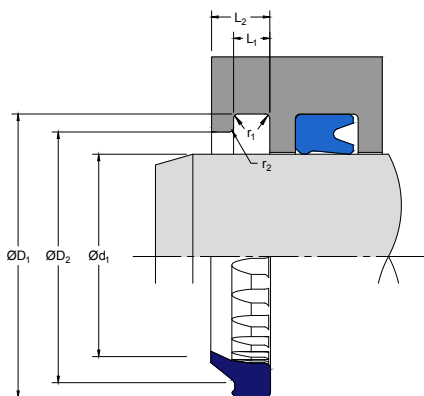
*Single-Acting
Polyurethane with AE Ring*

PART NUMBER RANGE

INCH					
Ød ₁	TOL f9	ØD ₁	TOL H10	L ₁ +0.010-0	PART No.
1.250	-0.001 -0.003	1.674	+0.003 -0.003	0.166	4878110
2.000	-0.001 -0.004	2.424	+0.004 -0.004	0.166	4521310
2.500	-0.001 -0.004	2.924	+0.004 -0.004	0.166	4514610
2.750	-0.001 -0.004	3.174	+0.004 -0.004	0.166	4533510
3.000	-0.001 -0.004	3.616	+0.004 -0.004	0.247	4515910
3.500	-0.001 -0.005	4.116	+0.004 -0.004	0.247	4514810
4.000	-0.001 -0.005	4.616	+0.004 -0.004	0.247	4524610
7.000	-0.002 -0.006	7.616	+0.006 -0.006	0.247	4588310
8.000	-0.002 -0.006	8.610	+0.006 -0.006	0.247	4753410
8.500	-0.002 -0.006	9.116	+0.006 -0.006	0.247	4744810
12.000	-0.002 -0.007	12.950	+0.007 -0.007	0.319	4764910



WIPERS



520

WIPER

*Single-Lipped
TPU/TPE Designed for D Style Housings*

DESIGN

The Hallite 520 single-lipped, snap-in rod wiper is designed to fit North American D-style housings. The proportions of the wiping lip ensure that contact is maintained with the surface of the rod to remove heavily deposited contaminants such as mud and ice.

The outside diameter of the wiper incorporates a crush lip to provide an interference fit with the housing and a face bead to ensure that the crush lip is not trapped in the corner of the housing. These features help prevent contamination from entering the groove.

The molded ribs on the internal diameter provide extra stability to the wiper and help prevent the possibility of blow-out due to pressure trapping between the wiper and the main rod seal.

The standard Hallite 520 is molded in polyurethane for maximum wear resistance and performance. For heavy duty and more complex applications, it is also offered in a wide range of Hythane® polyurethane and polyester materials to provide the best ingress protection.

In harsher environments with heavy contamination, the Hallite technical team may advise you to use a Hallite 820 wiper for better debris ingress protection.



FEATURES

- Crush lip and face bead design provides effective seal on housing
- Ribs relieve pressure and improve stability
- Design offers best-in-class ingress protection

MATERIALS

This product comes in a number of material options to extend operating conditions. Contact your local Hallite technical team to decide which is best for your application. Use the part designator in the table below as the last digit of the part number to specify material choice when ordering. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Seal Shell	Seal Color	Part Designator
Standard	Hythane® 251	TPU-EU	Dark Blue	0
Optional	TPE 121	TPE	Orange	1
Optional	Hythane® 361	TPU-AU	Orange	6



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	4.0 m/sec	12.0 ft/sec
Temperature Range	-45°C +110°C	-50°F +230°F

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

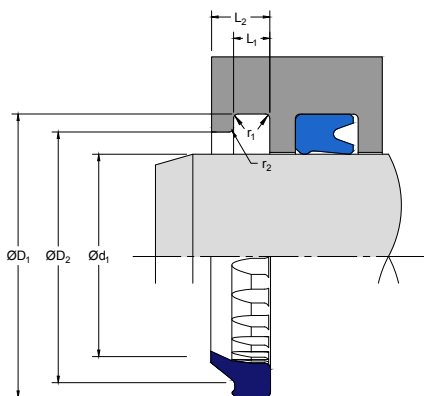
SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing d_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing D_1, \varnothing D_2$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

RADII	
Max Fillet Rad r_1 in	0.016
Max Fillet Rad r_2 in	0.016

NOTE

Assembly chamfers are governed by the associated rod seal.

TOLERANCES	$\varnothing d_1$	$\varnothing D_1$	$\varnothing D_2$	L_1
in	f9	±0.003	±0.005	+0.004 -0



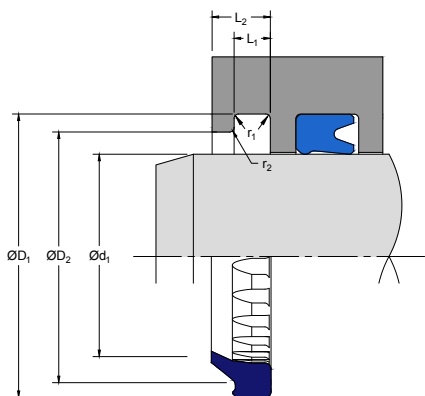
520

WIPER

*Single-Lipped
TPU/TPE Designed for D Style Housings*

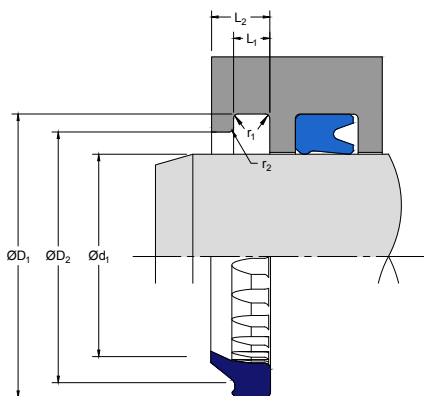
PART NUMBER RANGE

INCH						
Ød ₁	TOL f ₉	ØD ₁ ±0.003	ØD ₂ ±0.005	L ₁ +0.004-0	L ₂	PART No.
0.375	-0.001 -0.002	0.625	0.540	0.125	0.187	8889010
0.500	-0.001 -0.002	0.750	0.665	0.125	0.187	8880210
0.563	-0.001 -0.002	0.844	0.736	0.125	0.187	8888910
0.625	-0.001 -0.002	0.875	0.790	0.125	0.187	8880310
0.750	-0.001 -0.003	1.125	1.000	0.187	0.281	8880410
0.875	-0.001 -0.003	1.250	1.125	0.187	0.281	8880510
1.000	-0.001 -0.003	1.375	1.250	0.187	0.281	8880610
1.125	-0.001 -0.003	1.500	1.375	0.187	0.281	8880710
1.187	-0.001 -0.003	1.562	1.437	0.187	0.281	8880810
1.250	-0.001 -0.003	1.625	1.500	0.187	0.281	8880910
1.375	-0.001 -0.003	1.750	1.625	0.187	0.281	8881110
1.500	-0.001 -0.003	1.875	1.750	0.187	0.281	8881210
1.625	-0.001 -0.003	2.000	1.875	0.187	0.281	8881310
1.750	-0.001 -0.003	2.125	2.000	0.187	0.281	8881410
1.875	-0.001 -0.003	2.250	2.125	0.187	0.281	8887410
2.000	-0.001 -0.004	2.500	2.332	0.250	0.375	8881510
2.250	-0.001 -0.004	2.750	2.582	0.250	0.375	8881610



PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁ ±0.003	ØD ₂ ±0.005	L ₁ +0.004-0	L ₂	PART No.
2.375	-0.001 -0.004	2.875	2.707	0.250	0.375	8887210
2.500	-0.001 -0.004	3.000	2.832	0.250	0.375	8881710
2.625	-0.001 -0.004	3.125	2.957	0.250	0.375	4879400
2.750	-0.001 -0.004	3.250	3.082	0.250	0.375	8881810
3.000	-0.001 -0.004	3.500	3.332	0.250	0.375	8881910
3.250	-0.001 -0.005	3.750	3.582	0.250	0.375	8882010
3.500	-0.001 -0.005	4.000	3.832	0.250	0.375	8882110
3.750	-0.001 -0.005	4.250	4.082	0.250	0.375	8882210
3.875	-0.001 -0.005	4.375	4.207	0.250	0.375	8888810
4.000	-0.001 -0.005	4.500	4.332	0.250	0.375	8882310
4.250	-0.001 -0.005	4.750	4.582	0.250	0.375	8882410
4.500	-0.001 -0.005	5.000	4.832	0.250	0.375	8887510
4.500	-0.001 -0.005	5.250	4.998	0.375	0.562	8882510
4.750	-0.002 -0.006	5.500	5.248	0.375	0.562	8887310
4.875	-0.002 -0.006	5.625	5.373	0.375	0.562	8881010
5.000	-0.002 -0.006	5.500	5.332	0.250	0.375	8887910
5.000	-0.002 -0.006	5.750	5.498	0.375	0.562	8882610



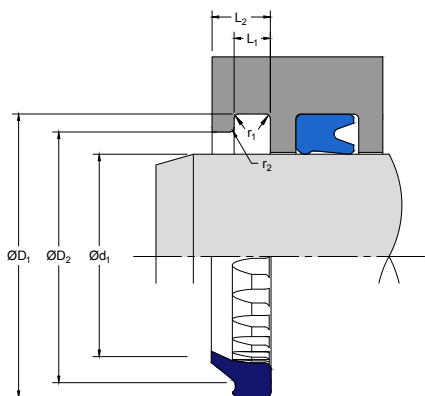
520

WIPER

*Single-Lipped
TPU/TPE Designed for D Style Housings*

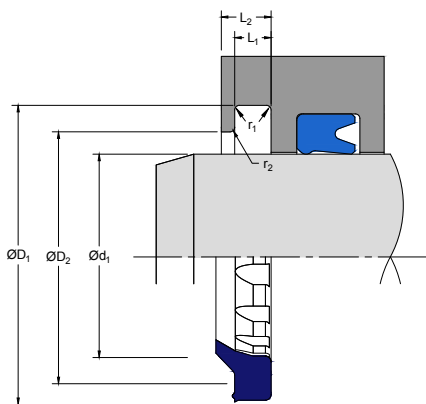
PART NUMBER RANGE

INCH						
Ød ₁	TOL f ₉	ØD ₁ ±0.003	ØD ₂ ±0.005	L ₁ +0.004-0	L ₂	PART No.
5.250	-0.002 -0.006	6.000	5.748	0.375	0.562	8882710
5.500	-0.002 -0.006	6.250	5.998	0.375	0.562	8882810
5.750	-0.002 -0.006	6.500	6.248	0.375	0.562	8889210
5.875	-0.002 -0.006	6.625	6.373	0.375	0.562	8887010
6.000	-0.002 -0.006	6.500	6.332	0.250	0.375	8888010
6.000	-0.002 -0.006	6.750	6.498	0.375	0.562	8882910
6.500	-0.002 -0.006	7.250	6.998	0.375	0.562	8892510
7.000	-0.002 -0.006	7.500	7.332	0.250	0.375	8888310
7.000	-0.002 -0.006	7.750	7.498	0.375	0.562	8883210
7.500	-0.002 -0.006	8.250	7.998	0.375	0.562	8883110
8.000	-0.002 -0.006	8.750	8.498	0.375	0.562	8883310
8.125	-0.002 -0.006	8.625	8.457	0.250	0.375	8888410
8.250	-0.002 -0.006	9.000	8.748	0.375	0.562	8892410
8.500	-0.002 -0.006	9.250	8.998	0.375	0.562	8888510
9.000	-0.002 -0.006	9.750	9.498	0.375	0.562	8884510
9.375	-0.002 -0.006	9.875	9.707	0.250	0.375	8889110
9.500	-0.002 -0.006	10.250	9.998	0.375	0.562	8885210



PART NUMBER RANGE

INCH						
$\varnothing d_1$	TOL f9	$\varnothing D_1$ ± 0.003	$\varnothing D_2$ ± 0.005	L_1 $+0.004-0$	L_2	PART No.
10.000	-0.002 -0.007	11.000	10.664	0.500	0.750	8889610
11.000	-0.002 -0.007	11.750	11.498	0.375	0.562	8891310
11.000	-0.002 -0.007	12.000	11.664	0.500	0.750	8909010
12.000	-0.002 -0.007	13.000	12.664	0.500	0.750	8888610
14.000	-0.003 -0.008	15.000	14.664	0.500	0.750	8888710
15.000	-0.003 -0.008	16.000	15.664	0.500	0.750	8889810



521

WIPER

*Single-Lipped
Designed for AN Style Housings*

DESIGN

The Hallite 521 snap-in rod wiper is designed for light-duty applications and to fit typical AN housings. The proportions of the wiping lip ensure that contact is maintained with the surface of the rod to remove contaminants.

The Hallite 521 is available in wide range of Hythane® polyurethanes and polyester materials to best suit your application needs.



FEATURES

- Precision trimmed sealing lip
- Low wear
- Crush lip and face bead design provides effective seal on housing
- Long life

MATERIALS

As standard, this product comes in the following material. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Seal Shell	Seal Color
Standard	Hythane® 251	TPU-EU	Dark Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	4.0 m/sec	12.0 ft/sec
Temperature Range	-45°C +110°C	-50°F +230°F

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

NOTE

Not designed to scrape ice.

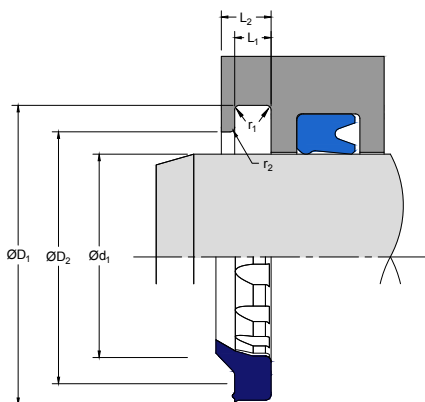
SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing d_1$	0.1 - 0.4	1.6 max	4 max	4-16	63 max	157 max
Static Sealing Face $\varnothing D_1, \varnothing D_2$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

RADII	
Max Fillet Rad r_1 in	0.010
Max Fillet Rad r_2 in	0.020

NOTE

Assembly chamfers are governed by the associated rod seal.

TOLERANCES	$\varnothing d_1$	$\varnothing D_1$	$\varnothing D_2$	L_1
in	f9	+0.004 -0	+0.005 -0	+0.003 -0



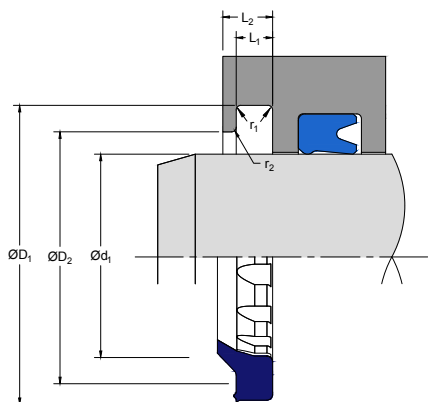
521

WIPER

*Single-Lipped
Designed for AN Style Housings*

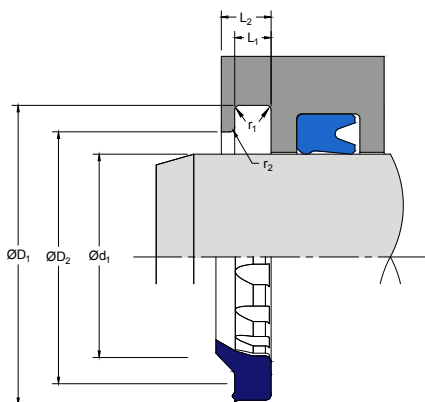
PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁ +0.004-0	ØD ₂ +0.005-0	L ₁ +0.003-0	L ₂	PART No.
0.500	-0.001 -0.002	0.760	0.647	0.107	0.187	8883510
0.563	-0.001 -0.002	0.822	0.710	0.107	0.187	8896300
0.625	-0.001 -0.002	0.885	0.772	0.107	0.187	8883610
0.687	-0.001 -0.002	0.947	0.834	0.107	0.187	8896400
0.750	-0.001 -0.003	1.010	0.897	0.107	0.187	8883710
0.812	-0.001 -0.003	1.084	0.960	0.107	0.187	8896500
0.875	-0.001 -0.003	1.147	1.023	0.107	0.187	8883810
0.937	-0.001 -0.003	1.209	1.085	0.107	0.187	8896600
1.000	-0.001 -0.003	1.272	1.148	0.107	0.187	8883910
1.125	-0.001 -0.003	1.397	1.273	0.107	0.187	8884010
1.187	-0.001 -0.003	1.459	1.335	0.107	0.187	8896700
1.250	-0.001 -0.003	1.522	1.398	0.107	0.187	8884110
1.312	-0.001 -0.003	1.614	1.480	0.107	0.187	8884200
1.375	-0.001 -0.003	1.677	1.542	0.107	0.187	8884310
1.500	-0.001 -0.003	1.802	1.668	0.107	0.187	8884410
1.625	-0.001 -0.003	1.927	1.793	0.107	0.187	8884500



PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁ +0.004-0	ØD ₂ +0.005-0	L ₁ +0.003-0	L ₂	PART No.
1.750	-0.001 -0.003	2.052	1.918	0.107	0.187	8884610
1.875	-0.001 -0.003	2.177	2.043	0.107	0.187	8884700
2.000	-0.001 -0.004	2.302	2.178	0.107	0.187	8884810
2.125	-0.001 -0.004	2.427	2.303	0.107	0.187	8884900
2.250	-0.001 -0.004	2.552	2.428	0.107	0.187	8885000
2.375	-0.001 -0.004	2.677	2.553	0.107	0.187	8896800
2.500	-0.001 -0.004	2.802	2.678	0.107	0.187	8885110
2.625	-0.001 -0.004	2.989	2.803	0.122	0.203	8896900
2.875	-0.001 -0.004	3.239	3.084	0.122	0.203	8885300
3.000	-0.001 -0.004	3.364	3.209	0.122	0.203	8885410
3.125	-0.001 -0.004	3.489	3.334	0.122	0.203	8897000
3.375	-0.001 -0.005	3.729	3.584	0.122	0.203	8885600
3.500	-0.001 -0.005	3.864	3.709	0.122	0.203	8885710
3.625	-0.001 -0.005	3.989	3.834	0.122	0.203	8885800
3.750	-0.001 -0.005	4.114	3.959	0.122	0.203	8885900
3.875	-0.001 -0.005	4.239	4.087	0.122	0.203	8886000



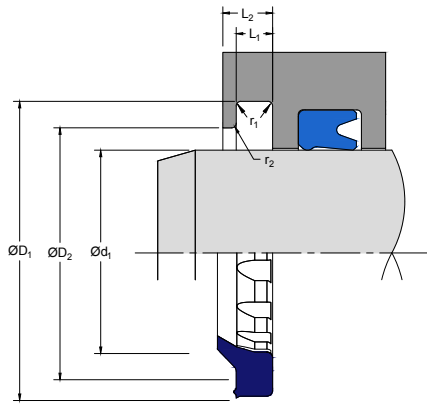
521

WIPER

*Single-Lipped
Designed for AN Style Housings*

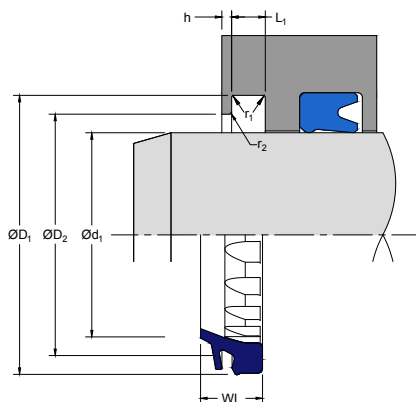
PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁ +0.004-0	ØD ₂ +0.005-0	L ₁ +0.003-0	L ₂	PART No.
4.000	-0.001 -0.005	4.427	4.240	0.138	0.203	8886110
4.125	-0.001 -0.005	4.552	4.365	0.138	0.218	8897100
4.250	-0.001 -0.005	4.677	4.490	0.138	0.218	8886200
4.750	-0.002 -0.006	5.177	4.990	0.138	0.218	8886400
4.875	-0.002 -0.006	5.300	5.115	0.138	0.218	8897400
5.000	-0.002 -0.006	5.427	5.240	0.138	0.218	8934510
5.125	-0.002 -0.006	5.552	5.365	0.138	0.218	8886600
5.250	-0.002 -0.006	5.667	5.490	0.138	0.218	8897500
5.375	-0.002 -0.006	5.802	5.615	0.138	0.218	8897600
5.625	-0.002 -0.006	6.114	5.897	0.154	0.250	8897700
5.750	-0.002 -0.006	6.239	6.022	0.154	0.250	8897800
6.000	-0.002 -0.006	6.489	6.272	0.154	0.250	8934610
6.250	-0.002 -0.006	6.739	6.522	0.154	0.250	8898000
6.500	-0.002 -0.006	6.989	6.772	0.154	0.250	8886900
7.250	-0.002 -0.006	7.739	7.522	0.154	0.250	8898300
7.500	-0.002 -0.006	7.989	7.772	0.154	0.250	8898400



PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁ +0.004-0	ØD ₂ +0.005-0	L ₁ +0.003-0	L ₂	PART No.
7.750	-0.002 -0.006	8.239	8.022	0.154	0.250	8898500
8.000	-0.002 -0.006	8.489	8.272	0.154	0.250	8887100
8.500	-0.002 -0.006	8.989	8.772	0.154	0.250	8898600
9.000	-0.002 -0.006	9.989	9.772	0.154	0.250	8898800
10.000	-0.002 -0.007	10.489	10.272	0.154	0.250	8898900
10.500	-0.002 -0.007	10.989	10.772	0.154	0.250	8899000
11.000	-0.002 -0.007	11.489	11.272	0.154	0.250	8899100
11.500	-0.002 -0.007	11.989	11.772	0.154	0.250	8899200



820

WIPER

*Single-Lipped
Polyurethane with Umbrella Design Technology™
for American D Wiper Housings*

DESIGN

The Hallite 820 single-lipped, snap-in rod wiper is designed to fit North American D-style housings and has been developed specifically for use in harsher environments with heavy contamination, such as in agriculture, off-highway, and forestry equipment.

The unique feature of the Hallite 820 is the Umbrella Wiper Technology™, which is a protective debris guard flap on the wiping lip that entirely covers the gland housing and prevents the water/slurry trap that is common with conventional wipers. This feature offers added protection to the integrity of the hydraulic system by reducing corrosion and preventing the ingress of contamination into the wiper housing groove and hydraulic cylinder gland which will result in increased system life.

The molded ribs on the internal diameter provide extra stability to the wiper and help prevent the possibility of blow-out due to pressure trapping between the wiper and the main rod seal.

Another advantage of the Hallite 820 is that it is easy to install without the use of special tooling, as in the case of the metal press-in wipers normally specified for harsh environments.

The standard Hallite 820 is molded in Hythane® 251, Hallite's high-performance polyurethane, for easy installation and excellent low temperature performance. The Hallite 820 is also offered in a number of other high-performance polyurethanes, such as Hythane® 361 and the Hythane® 371, a very aggressive scraping material with proven track record in forestry, mining, and aggregate industries.



FEATURES

- Precision trimmed wiping lip
- Retrofits most 'D' wiper housings
- Especially effective in vertically mounted cylinders
- Designed to follow the rod deflection caused by side loads
- Interchangeable with Hallite 520 wiper
- Sharp wiping lip scrapes heavy contamination from rod protecting sealing system
- Umbrella Wiper Technology™ protects housing from contamination and reduces moisture ingress

MATERIALS

This product comes in a number of material options to extend operating conditions. Contact your local Hallite technical team to decide which is best for your application. Use the part designator in the table below as the last digit of the part number to specify material choice when ordering. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color	Part Designator
Standard	Hythane® 251	Polyurethane	Dark Blue	0
Optional	Hythane® 371	Polyurethane	Dark Green	7
Optional	Hythane® 361	Polyurethane	Orange	6



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	4.0 m/sec	12.0 ft/sec
Temperature Range	-45°C +110°C	-50°F +230°F

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face $\varnothing d_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing D_1, \varnothing D_2, h$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

RADII	
Max Fillet Rad r_1 in	0.016
Max Fillet Rad r_2 in	0.016

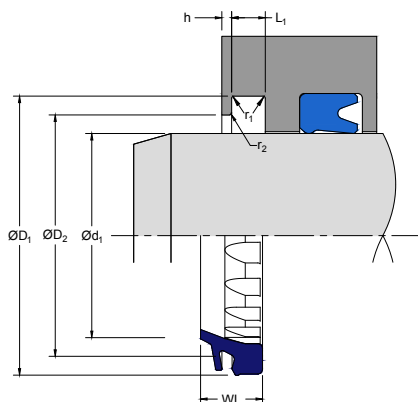
NOTE

Assembly chamfers are governed by the associated rod seal.

TOLERANCES	$\varnothing d_1$	$\varnothing D_1$	$\varnothing D_2$	L_1	h
in	f9	±0.003	±0.005	+0.004 -0	+0.004 -0

NOTE

Customer should verify the h and the $\varnothing D_2$ dimensions before purchasing.



820

WIPER

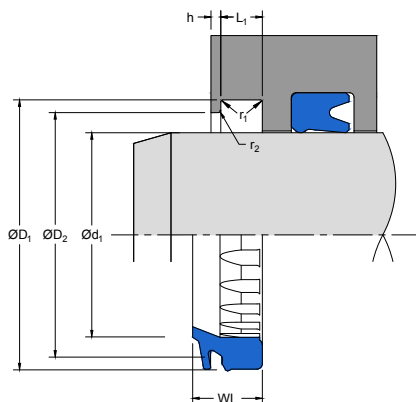
*Single-Lipped
Polyurethane with Umbrella Design Technology™
for American D Wiper Housings*

PART NUMBER RANGE

INCH							
Ød ₁	TOL f ₉	ØD ₁ ±0.003	ØD ₂ ±0.005	L ₁ +0.004-0	h +0.004-0	WL	PART No.
1.125	-0.001 -0.003	1.500	1.375	0.187	0.094	0.350	4855600
1.250	-0.001 -0.003	1.625	1.500	0.187	0.094	0.350	4855700
1.375	-0.001 -0.003	1.750	1.625	0.187	0.094	0.350	4855800
1.500	-0.001 -0.003	1.875	1.750	0.187	0.094	0.350	4855900
1.750	-0.001 -0.003	2.125	2.000	0.187	0.094	0.350	4856000
2.000	-0.001 -0.004	2.500	2.332	0.250	0.125	0.450	4837800
2.250	-0.001 -0.004	2.750	2.582	0.250	0.125	0.450	4856100
2.500	-0.001 -0.004	3.000	2.832	0.250	0.125	0.450	4856200
3.000	-0.001 -0.004	3.500	3.332	0.250	0.125	0.450	4856300
3.500	-0.001 -0.005	4.000	3.832	0.250	0.125	0.450	4856400
4.000	-0.001 -0.005	4.500	4.332	0.250	0.125	0.450	4856500
4.500	-0.001 -0.005	5.250	4.998	0.375	0.187	0.674	4856600
5.000	-0.002 -0.006	5.750	5.498	0.375	0.187	0.674	4856700
6.000	-0.002 -0.006	6.750	6.498	0.375	0.187	0.674	4856800

NOTE

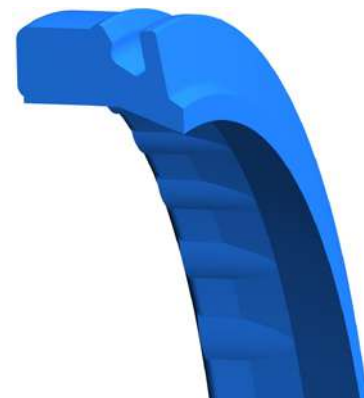
Customer should verify the h and the ØD₂ dimensions before purchasing.



842

WIPER

*Single-Lipped
Polyurethane with Umbrella Design Technology™*



DESIGN

The Hallite 842 single-lipped, snap-in rod wiper is developed specifically for use in harsher environments with heavy contamination, such as in agriculture, off-highway, forestry, and long wall mining equipment.

The unique feature of the Hallite 842 is the Umbrella Wiper Technology™, which is a protective debris guard flap on the wiping lip that entirely covers the gland housing and prevents the water/slurry trap that is common with conventional wipers. This feature offers added protection to the integrity of the hydraulic system by reducing corrosion and preventing the ingress of contamination into the wiper housing groove and hydraulic cylinder gland which will result in increased system life.

The molded ribs on the internal diameter provide extra stability to the wiper and help prevent the possibility of blow-out due to pressure trapping between the wiper and the main rod seal.

The standard Hallite 842 is molded in Hythane® 181, Hallite's high-performance polyurethane, for easy installation and excellent low temperature performance. The Hallite 820 is also offered in a number of other high-performance polyurethanes, such as Hythane® 371, a very aggressive scrapping material with proven track record in forestry, mining, and aggregate industries. The wiper has been proven compatible with HFA (95/5) fluids, as used in longwall mining equipment, and with mineral oil.

FEATURES

- Precision trimmed wiper lips
- Long life and long wear
- Umbrella Wiper Technology™ protects housing from contaminants
- Easy to install

MATERIALS

This product comes in a number of material options to extend operating conditions. Contact your local Hallite technical team to decide which is best for your application. Use the part designator in the table below as the last digit of the part number to specify material choice when ordering. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color	Part Designator
Standard	Hythane® 181	TPU-EU	Blue	0
Optional	Hythane® 361	TPU-AU	Orange	6
Optional	Hythane® 371	TPU-AU	Dark Green	7



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	4.0 m/sec	12.0 ft/sec
Temperature Range	-45°C +110°C	-50°F +230°F

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

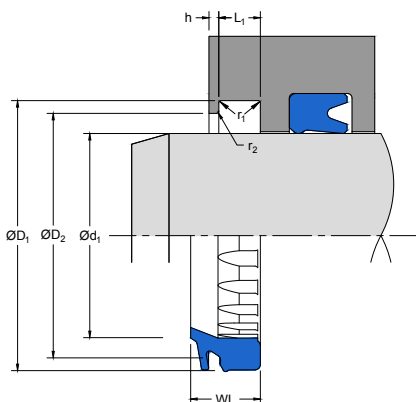
SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face Ød ₁	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face ØD ₁ , ØD ₂ , h	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L ₁	3.2 max	10 max	16 max	125 max	394 max	630 max

RADII				
Rod Diameter Ød ₁ mm	≤ 50	> 90	≤ 200	> 200
Max Fillet Rad r ₁ mm	0.40	0.40	0.40	0.80
Max Fillet Rad r ₂ mm	0.20	0.40	0.60	0.80
Rod Diameter Ød ₁ in	≤ 2.000	≤ 3.500	≤ 7.875	> 7.875
Max Fillet Rad r ₁ in	0.016	0.016	0.016	0.032
Max Fillet Rad r ₂ in	0.008	0.016	0.024	0.032

NOTE

Assembly chamfers are governed by the associated rod seal.

TOLERANCES	Ød ₁	ØD ₁	ØD ₂	L ₁	h
mm	f9	H11	H11	+0.20 -0	+0.10 +0
in	f9	H11	H11	+0.008 -0	+0.004 +0



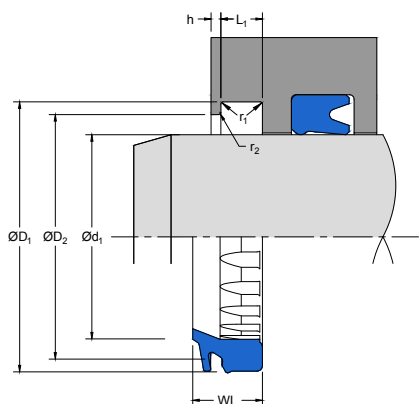
842

WIPER

Single-Lipped
Polyurethane with Umbrella Design Technology™

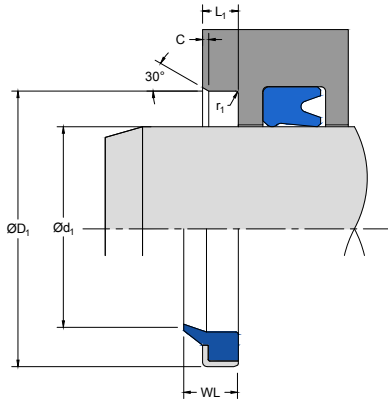
PART NUMBER RANGE

INCH									
Ød ₁	TOL f9	ØD ₁	TOL H11	ØD ₂	TOL H11	L ₁ +0.008 -0	h +0.004 +0	WL	PART No.
1.750	-0.001 -0.003	2.125	+0.007 0.000	1.995	+0.007 0.000	0.220	0.079	0.362	4543300
2.000	-0.001 -0.004	2.375	+0.007 0.000	2.245	+0.007 0.000	0.220	0.079	0.362	4543200
2.500	-0.001 -0.004	2.875	+0.007 0.000	2.745	+0.007 0.000	0.220	0.079	0.362	4708200
2.750	-0.001 -0.004	3.125	+0.007 0.000	2.995	+0.007 0.000	0.220	0.079	0.362	4554600
3.000	-0.001 -0.004	3.375	+0.009 0.000	3.245	+0.009 0.000	0.220	0.079	0.362	4543400
3.125	-0.001 -0.004	3.500	+0.009 0.000	3.370	+0.009 0.000	0.220	0.079	0.362	4543100
3.250	-0.001 -0.005	3.625	+0.009 0.000	3.495	+0.009 0.000	0.220	0.079	0.362	4721400
3.375	-0.001 -0.005	3.750	+0.009 0.000	3.620	+0.009 0.000	0.220	0.079	0.362	4554700
3.500	-0.001 -0.005	3.875	+0.009 0.000	3.745	+0.009 0.000	0.220	0.079	0.362	4818700
3.625	-0.001 -0.005	4.000	+0.009 0.000	3.870	+0.009 0.000	0.220	0.079	0.362	4543000
3.750	-0.001 -0.005	4.125	+0.009 0.000	3.995	+0.009 0.000	0.220	0.079	0.362	4708300
3.875	-0.001 -0.005	4.250	+0.009 0.000	4.120	+0.009 0.000	0.220	0.079	0.362	4523600
4.000	-0.001 -0.005	4.375	+0.009 0.000	4.245	+0.009 0.000	0.220	0.079	0.362	4708400
4.375	-0.001 -0.005	4.875	+0.010 0.000	4.715	+0.009 0.000	0.312	0.080	0.472	4707800
4.750	-0.002 -0.006	5.250	+0.010 0.000	5.090	+0.010 0.000	0.312	0.080	0.472	4547300
5.000	-0.002 -0.006	5.500	+0.010 0.000	5.340	+0.010 0.000	0.312	0.080	0.472	4708500



PART NUMBER RANGE

INCH									
Ød ₁	TOL f ₉	ØD ₁	TOL H ₁₁	ØD ₂	TOL H ₁₁	L ₁ +0.008 -0	h +0.004 +0	WL	PART No.
5.250	-0.002 -0.006	5.750	+0.010 0.000	5.590	+0.010 0.000	0.312	0.080	0.472	4707900
5.750	-0.002 -0.006	6.250	+0.010 0.000	6.090	+0.010 0.000	0.312	0.080	0.472	4547400
6.000	-0.002 -0.006	6.500	+0.010 0.000	6.340	+0.010 0.000	0.312	0.080	0.472	4708600
6.250	-0.002 -0.006	7.000	+0.010 0.000	6.745	+0.010 0.000	0.500	0.100	0.740	4708000
6.750	-0.002 -0.006	7.250	+0.012 0.000	7.090	+0.010 0.000	0.312	0.080	0.472	4547500
7.000	-0.002 -0.006	7.500	+0.012 0.000	7.340	+0.012 0.000	0.312	0.080	0.472	4708700
7.000	-0.002 -0.006	7.750	+0.012 0.000	7.495	+0.012 0.000	0.500	0.100	0.740	4588400
7.000	-0.002 -0.006	8.000	+0.012 0.000	7.625	+0.012 0.000	0.500	0.125	0.740	4774100
7.750	-0.002 -0.006	8.250	+0.012 0.000	8.090	+0.012 0.000	0.312	0.080	0.472	4547600
8.000	-0.002 -0.006	8.500	+0.012 0.000	8.340	+0.012 0.000	0.312	0.080	0.472	4708800
8.750	-0.002 -0.006	9.250	+0.012 0.000	9.090	+0.012 0.000	0.312	0.080	0.472	4536700



860

WIPER

*Single-Lipped
Polyurethane, Metal-Cased*

DESIGN

The Hallite 860 single-lipped, metal-cased wiper is designed to press fit into open groove housings for a wide range of applications.

The precision trimmed polyurethane wiping element is securely bonded to a metal case treated to inhibit rust. The proportions of the polyurethane wiping lip follow the side movement of the rod to clear away heavily deposited dirt and make this wiper an excellent choice for dirty conditions.

The Hallite 860 is offered in a range of sizes suitable for ISO 6195 Type B housings and also for standard Asian housings.



FEATURES

- Precision trimmed wiping lip
- Sharp wiping lip scrapes heavy contamination from rod protecting sealing system
- Metal case treated with rust inhibitor
- Wide range of application uses

MATERIALS

As standard, this product comes in the following materials. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color
Standard	Hythane® 321-Steel	TPU-AU	Dark Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-40°C +100°C	-40°F +212°F

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

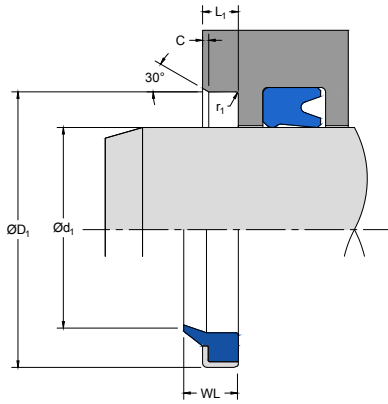
SURFACE ROUGHNESS	µmRa	µmRz	µmRt	µinRa	µinRz	µinRt
Dynamic Sealing Face Ød ₁	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face ØD ₁	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L ₁	3.2 max	10 max	16 max	125 max	394 max	630 max

RADII				
Rod Diameter Ød ₁	≤ 19	≥ 19	< 0.75	≥ 0.75
Min Chamfer C	0.50	1.00	0.020	0.040
Max Fillet Rad r ₁	0.40	0.40	0.016	0.016

NOTE

Assembly chamfers on the rod are governed by the associated seal.

TOLERANCES	Ød ₁	ØD ₁	L ₁
mm	f9	H8	+0.50 -0
in	f9	H8	+0.020 -0



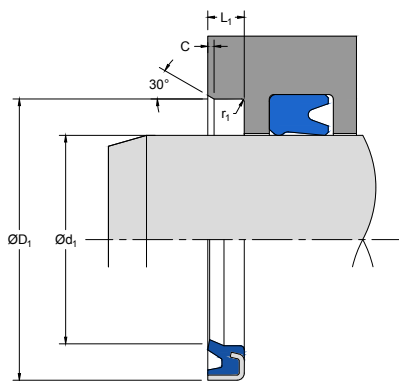
860

WIPER

*Single-Lipped
Polyurethane, Metal-Cased*

PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL H8	L ₁ +0.020 -0	WL	PART No.
0.750	-0.001 -0.003	1.125	+0.001 0.000	0.187	0.297	6955100
1.000	-0.001 -0.003	1.375	+0.002 0.000	0.187	0.297	6955120
1.250	-0.001 -0.003	1.625	+0.002 0.000	0.187	0.297	6955140
1.500	-0.001 -0.003	1.875	+0.002 0.000	0.187	0.297	6955160
1.750	-0.001 -0.003	2.125	+0.002 0.000	0.187	0.297	6955180
2.000	-0.001 -0.004	2.375	+0.002 0.000	0.187	0.297	6955200
2.250	-0.001 -0.004	2.625	+0.002 0.000	0.187	0.297	6955220
2.500	-0.001 -0.004	2.875	+0.002 0.000	0.187	0.297	6955240
2.750	-0.001 -0.004	3.125	+0.002 0.000	0.187	0.297	6955260
3.000	-0.001 -0.004	3.375	+0.002 0.000	0.187	0.297	6955280



862

WIPER

*Single-Lipped
Polyurethane, Metal-Cased*

DESIGN

The Hallite 862 single-lipped, metal-cased wiper is designed to press fit into open groove housings for a wide range of applications.

The precision trimmed polyurethane wiping element is securely bonded to a metal case treated to inhibit rust. The proportions of the polyurethane wiping lip follow the side movement of the rod to clear away heavily deposited dirt and make this wiper an excellent choice for dirty conditions.

The Hallite 862 is offered in a range of sizes suitable for standard American inch wiper housings.



FEATURES

- Precision trimmed wiping lip
- Sharp wiping lip scrapes heavy contamination from rod protecting sealing system
- Metal case treated with rust inhibitor
- Wide range of application uses

MATERIALS

As standard, this product comes in the following materials. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color
Standard	Hythane® 321-Steel	TPU-AU	Dark Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-40°C +110°C	-40°F +212°F

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

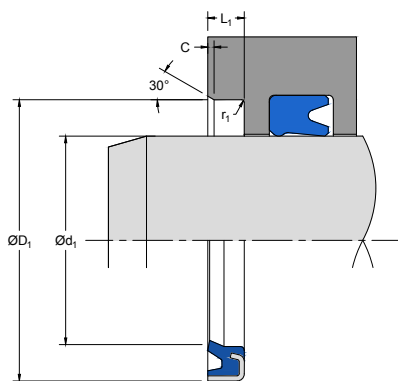
SURFACE ROUGHNESS	µmRa	µmRz	µmRt	µinRa	µinRz	µinRt
Dynamic Sealing Face $\varnothing d_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing D_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

RADII	
Min Chamfer C in	0.040
Max Fillet Rad r_1 in	0.016

NOTE

Assembly chamfers on the rod are governed by the associated seal.

TOLERANCES	$\varnothing d_1$	$\varnothing D_1$	L_1
in	f9	H8	+0.020 -0



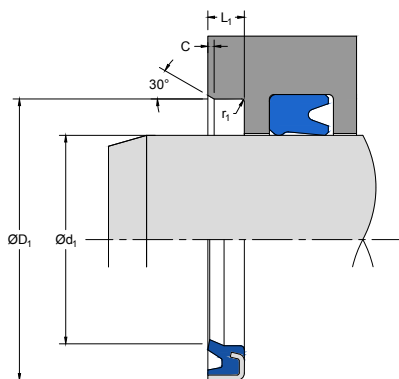
862

WIPER

Single-Lipped
Polyurethane, Metal-Cased

PART NUMBER RANGE

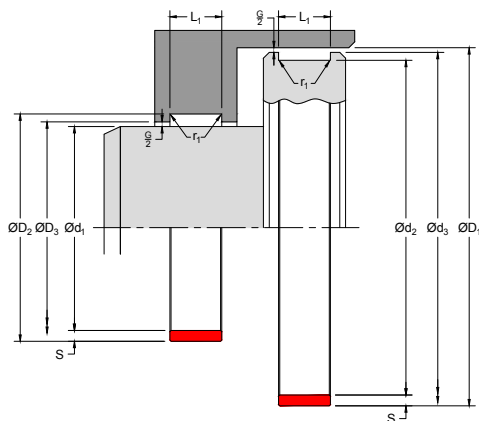
INCH					
ϕd_1	TOL f9	ϕD_1	TOL H8	L_1 +0.020-0	PART No.
0.625	-0.001 -0.002	1.125	+0.001 0.000	0.313	6960000
0.750	-0.001 -0.003	1.250	+0.002 0.000	0.313	6960010
1.000	-0.001 -0.003	1.500	+0.002 0.000	0.313	6960020
1.125	-0.001 -0.003	1.625	+0.002 0.000	0.313	6960030
1.250	-0.001 -0.003	1.750	+0.002 0.000	0.250	6960260
1.250	-0.001 -0.003	1.750	+0.002 0.000	0.313	6960040
1.375	-0.001 -0.003	1.875	+0.002 0.000	0.313	6960050
1.500	-0.001 -0.003	2.000	+0.002 0.000	0.250	6960270
1.500	-0.001 -0.003	2.000	+0.002 0.000	0.313	6960060
1.625	-0.001 -0.003	2.125	+0.002 0.000	0.313	6960070
1.750	-0.001 -0.003	2.250	+0.002 0.000	0.313	6960080
2.000	-0.001 -0.004	2.500	+0.002 0.000	0.313	6960090
2.250	-0.001 -0.004	2.750	+0.002 0.000	0.313	6960100
2.500	-0.001 -0.004	3.000	+0.002 0.000	0.313	6960110
2.750	-0.001 -0.004	3.250	+0.002 0.000	0.313	6960120
3.000	-0.001 -0.004	3.500	+0.002 0.000	0.313	6960130



PART NUMBER RANGE

INCH					
$\varnothing d_1$	TOL f9	$\varnothing D_1$	TOL H8	L_1 +0.020-0	PART No.
3.250	-0.001 -0.005	3.750	+0.002 0.000	0.313	6960140
3.250	-0.001 -0.005	3.875	+0.002 0.000	0.313	6960150
3.500	-0.001 -0.005	4.000	+0.002 0.000	0.313	6960160
3.500	-0.001 -0.005	4.125	+0.002 0.000	0.313	6960170
3.750	-0.001 -0.005	4.375	+0.002 0.000	0.313	6960180
4.000	-0.001 -0.005	4.625	+0.002 0.000	0.313	6960190
4.000	-0.001 -0.005	4.750	+0.003 0.000	0.313	6960200
4.000	-0.001 -0.005	5.000	+0.003 0.000	0.500	6960210
4.500	-0.001 -0.005	5.125	+0.003 0.000	0.313	6960220
4.500	-0.001 -0.005	5.500	+0.003 0.000	0.500	6960230
5.000	-0.002 -0.006	5.625	+0.003 0.000	0.313	6960240
5.000	-0.002 -0.006	6.000	+0.003 0.000	0.500	6960250

BEARINGS



506

BEARING

Polyester Fabric, Rod and Piston and Coil

DESIGN

The Hallite 506 bearing strip is designed to provide an extremely effective, hard wearing, and easy-to-use bearing solution for reciprocating, oscillating, and slow rotary movement applications. Manufactured to very tight tolerances, the Hallite 506 is capable of withstanding extreme side loads and preventing metal-to-metal contact between the piston and the bore or the rod and the gland. The Hallite 506 has become the industry standard favoured by designers and specifiers alike in many of today's most arduous hydraulic applications around the world.

The Hallite 506 is available in three forms: cut bearing rings, spiral lengths, and flat coils. Spiral lengths and flat coils are recommended to customers who want to cut their own custom sizes. Spiral lengths are recommended to distributors or customers who may need to fit a wide range of application sizes in a particular cross section.

The Hallite 506 bearing strip is manufactured by a patented process, using a woven fabric reinforced polyester resin material, and is proven to be compatible with a wide range of fluids including: mineral oils, water-based fluids, and phosphate esters. The construction of the bearing strip incorporates micro-indentations on the surface to trap fluid and provide built-in lubrication to the bearing.

The rectangular section strip is available in a wide range of inch and metric sizes, including cross sections specified in ISO 10766.



FEATURES

- Tight tolerances
- Available in ready-made bearings cut to size and to customer specifications
- Available in spiral lengths and flat coils
- Low friction

MATERIALS

This product comes in a number of material options to extend operating conditions. Contact your local Hallite technical team to decide which is best for your application. Use the part designator in the table below as the last digit of the part number to specify material choice when ordering. For further material details, please refer to the Hallite Material Table in front of catalog.

MATERIAL OPTIONS	Name	Type	Color
Standard	TSE 041	Thermoset Polyester	Red
Optional	TSE 042	Thermoset Polyester (Reduced Friction)	Red



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC		INCH	
Temperature Range	-40°C +120°C		-40°F +250°F	
Limiting PV Values Lubricated*	Speed(V) m/sec	Pressure(P) MN/m ²	Speed(V) ft/sec	Pressure(P) psi.
	0.1	10.0	0.3	1500
	1.0	6.0	3.0	900
	5.0	0.8	16.0	120

NOTE

Please note that for reciprocating applications, the compressive stress at yield should be used for design calculations. For rotary shafts use the limiting P.V. values, it is suggested that a 2:1 factor of safety is applied

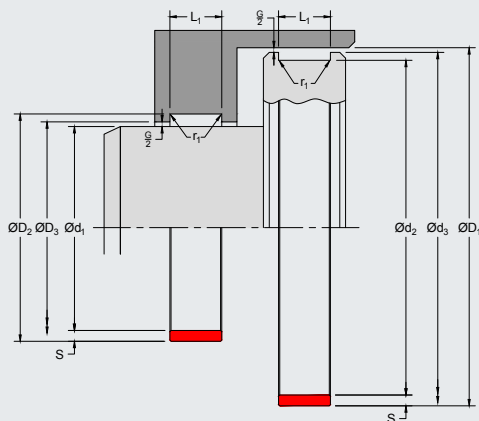
NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

TYPICAL PHYSICAL PROPERTIES	METRIC	INCH
Specific Gravity	1.27	1.27
Compression Stress at Failure	450 MN/m ² @ 23°C	65000 psi @ 73°F
Compression Stress at Yield	115 MN/m ² @ 23°C	16500 psi @ 73°F
Compression Stress at Yield	58 MN/m ² @ 80°C	8500 psi @ 176°F
Coefficient of Thermal Conductivity	0.27 W/mK	0.16 Btu/hft °F
Coefficient of Thermal Expansion - Thickness	9 X 10 ⁻⁵ per °C	5 X 10 ⁻⁵ per °F
Coefficient of Thermal Expansion - Length	13 X 10 ⁻⁵ per °C	7.3 X 10 ⁻⁵ per °F
Coefficient of Dynamic Friction on Steel Surface (0.2 µmRa) / (8 µinCLA)	Dry 0.50	Dry 0.50
	Lubricated 0.06	Lubricated 0.06

BEARING STRIP TOLERANCES	L ₁ mm	S mm	L ₁ in	S in
	-0.10 -0.60	-0.02 -0.08	-0.005 -0.025	-0.001 -0.003

WIDTH OF BEARING SPLIT – W	Ød ₁ , ØD ₁ mm	W mm	Ød ₁ , ØD ₁ in	W in
	≤50	3.00 - 1.50	≤2	0.12 - 0.06
	≤120	5.00 - 3.50	≤5	0.19 - 0.14
	≤250	9.00 - 7.25	≤10	0.35 - 0.29
	≤550	17.00 - 15.00	≤22	0.67 - 0.59



506

BEARING

Polyester Fabric, Rod and Piston and Coil

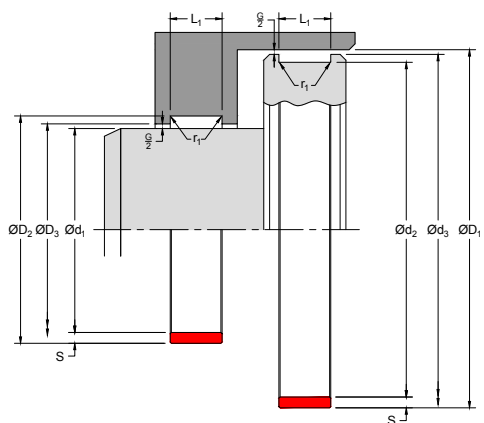
HOUSING DETAILS & TOLERANCES	METRIC		INCH	
Rod	Ød ₁ mm	f9	Ød ₁ in	f9
	ØD ₂ = Ød ₁ + 2S mm	≤ Ø80.00 H10 > Ø80.00 H9	ØD ₂ = Ød ₁ + 2S in	≤ Ø3.000 H10 > Ø3.000 H9
	ØD ₃ = Ød ₁ + G mm	G min / max	ØD ₃ = Ød ₁ + G in	G min / max
	L ₁ mm	+0.20 -0	L ₁ in	+0.008 -0
	Max Fillet Rad r ₁ mm	0.40	Max Fillet Rad r ₁ in	0.016
Piston	ØD ₁ mm	H11	ØD ₁ in	H11
	Ød ₂ = ØD ₁ - 2S mm	h8	OD ₂ = ØD ₁ - 2S in	f9
	Ød ₃ = ØD ₁ - G mm	G min / max	Ød ₃ = ØD ₁ - G in	G min / max
	L ₁ mm	+0.20 -0	L ₁ in	+0.008 -0
	Max Fillet Rad r ₁ mm	0.40	Max Fillet Rad r ₁ in	0.016

HOUSING SURFACE ROUGHNESS	µmRa	µmRz	µmRt	µinRa	µinRz	µinRt
Dynamic Sealing Face Ød ₁ , ØD ₁	0.4	1.6 max	4 max	16	63 max	157 max
Static Sealing Face ØD ₂ , L ₁ , Ød ₂	3.2 max	10 max	16 max	125 max	394 max	630 max

NOTE

G min controls the minimum metal-to-metal clearance between the gland and rod or between bore and piston. G max controls the maximum extrusion gap seen by a seal associated with the bearing. Typically, G min should be 0.70mm/0.0280in but can be reduced when required by the extrusion gap for the seal and the build up of tolerances. The absolute minimum metal-to-metal clearance recommended is 0.10mm/0.004in. More information can be found in the Housing Designs and Extrusion Gaps pages at the front of the catalogue. For applications not using a seal, see part number range for G Max values.





IDENTIFICATION & INSTALLATION

The ranges shown on the following pages are Hallite's most popular sizes. The section ranges identify section and groove width; from these nearly any diameter of cut ring or spiral length can be manufactured. If you cannot find the size you are looking for, please contact your local Hallite sales office for additional size information.

- Cut rings are ready made bearings cut to size to suit either rod or piston housings or ready for installation. These are ideal for medium to high volume user. A comprehensive list of cut ring sizes can be found on the Hallite web site or, in the future, the Hallite Product Finder app.
- Spiral lengths are available in a wide range of preformed diameters and are supplied in continuous lengths to suit a range of inside and outside diameters. These are ideal for lower volume users required various diameters. A range of the spiral sizes can be found in the part number listing on the following pages.
- Flat coils are packaged in a dispenser for ease of storage and handling. The flat coils are supplied in 10 meter lengths suitable for a wide range of diameters. These are ideal for using or supplying one-off bearings for small volume requirements. A range of the flat coil sizes can be found in the part number listing on the following pages.

All standard bearing strips are printed with a size reference and include distance marking every 100mm on metric size sections and every six inches on inch size sections for guidance only.

When ordering please clearly state whether cut rings, spiral lengths or flat coils are required.

For cut rings and spiral lengths please state whether the application is for a rod or piston and provide inside ($\varnothing d$) or outside ($\varnothing D$) diameters, groove width ($L1$) and section (S) dimensions. Where spiral lengths are ordered also specify length required.

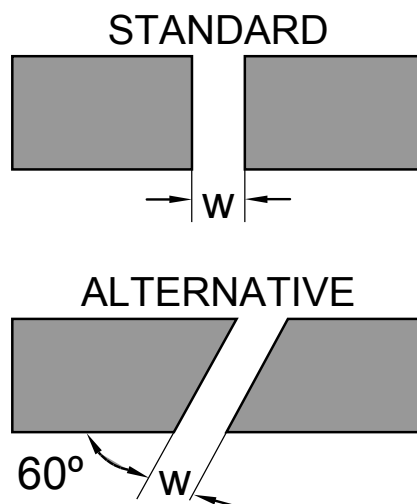
For flat coils please specify groove width ($L1$) and section (S) dimensions.

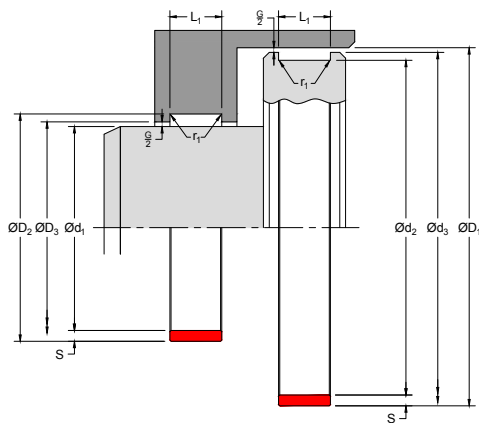
INSTRUCTIONS FOR CUTTING BEARING STRIP TO SIZE:

1. Select the groove width ($L1$) and section (S) required.
2. In the case of a rod bearing, position the bearing strip around the rod or in the case of a piston bearing, fit the bearing strip in the piston groove and mark the point of overlap. Determine the correct width of bearing split (W) for the $\varnothing d$ or $\varnothing D$ being used, as indicated in the technical details, and make a second mark.
3. Remove the strip and cut at the second marked position to the desired angle using anvil cutters or other similar cutting tool.

It is recommended that the standard cutting angle is used for the majority of applications.

If necessary, coil diameters can be resized by curing on a suitable mandrel in an oven for one hour at 120°C (250°F) and allowing to cool on the mandrel.





506

BEARING

Polyester Fabric, Rod and Piston and Coil

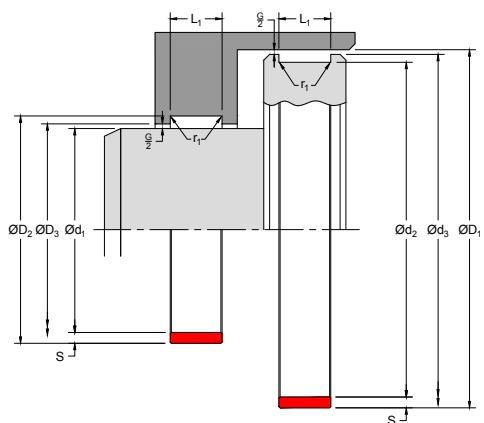
SECTION RANGE

METRIC					
S	L ₁	S	L ₁	S	L ₁
1.50	5.60	2.50	15.00‡	3.00	30.00
2.00	6.30	2.50	16.00	3.00	35.00
2.00	8.10	2.52	19.50	3.00	40.00
2.00	9.70	2.50	20.00	3.20	9.70
2.00	10.00	2.50	25.00‡	3.20	19.70
2.00	15.00	2.52	30.00	3.50	25.00
2.00	20.00	2.50	35.00	4.00	5.00
2.00	22.00	2.50	40.00	4.00	6.10
2.00	25.00	2.50	50.00	4.00	9.70
2.50	5.60‡	3.00	9.70	4.00	15.00
2.50	6.30	3.00	12.00	4.00	20.00
2.50	7.00	3.00	12.80	4.00	25.00‡
2.50	8.00	3.02	15.00	4.00	30.00
2.50	9.70‡	3.00	16.00	4.00	35.00
2.50	12.00	3.00	20.00	4.00	40.10
2.50	13.00	3.00	25.00		

NOTE Within the size range, items suffixed ‡ indicate cross sections to ISO 10766.

INCH

S	L ₁
0.063	0.375
0.125	0.375
0.125	0.500
0.125	0.625
0.125	0.750
0.125	1.000
0.125	1.500



SPIRAL LENGTHS

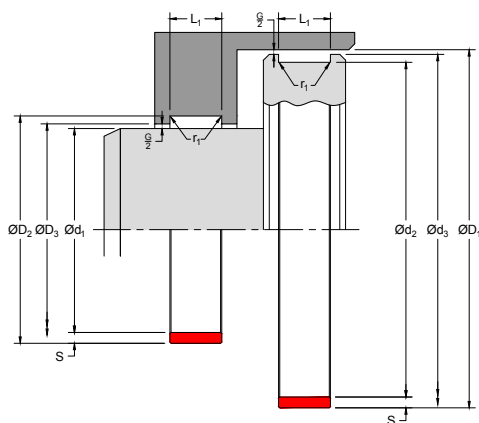
METRIC						
Ød ₁	ØD ₁	S	L ₁	G MAX	G MIN*	PART NO.
25 - 41	45 - 90	2.00	10.00		0.70	8501310
35 - 70	74 - 160	2.00	10.00		0.70	8502610
70 - 155	159 - 310	2.00	10.00		0.70	8502252
35 - 50	54 - 110	2.00	15.00		0.70	8503357
50 - 100	104 - 210	2.00	15.00		0.70	8503175
90 - 180	184 - 370	2.00	15.00		0.70	8503358
25 - 30	35 - 70	2.50	5.60		0.70	8502000†
25 - 50	55 - 110	2.50	5.60		0.70	8502020†
50 - 100	105 - 210	2.50	5.60		0.70	8502040†
25 - 40	45 - 90	2.50	9.70		0.70	8502100†
35 - 70	75 - 150	2.50	9.70		0.70	8502120†
70 - 150	155 - 310	2.50	9.70		0.70	8502140†
40 - 50	55 - 110	2.50	13.00		0.70	8502200
50 - 100	105 - 210	2.50	13.00		0.70	8502220
90 - 180	185 - 370	2.50	13.00		0.80	8502230
40 - 50	55 - 110	2.50	15.00		0.70	8502300†
50 - 100	105 - 210	2.50	15.00		0.70	8502330†
90 - 180	185 - 370	2.50	15.00		0.80	8502350†
50 - 80	85 - 170	2.50	20.00		0.70	8502400
75 - 150	155 - 310	2.50	20.00		0.80	8502410
125 - 250	255 - 510	2.50	20.00		0.80	8502430
60 - 80	85 - 170	2.50	25.00		0.70	8502500†
70 - 150	155 - 310	2.50	25.00		0.80	8502520†
125 - 250	255 - 510	2.50	25.00		0.80	8502530†
40 - 50	56 - 100	3.00	9.70		0.80	8503369
50 - 100	106 - 210	3.00	9.70		0.80	8503370
100 - 150	156 - 310	3.00	9.70		0.80	8503371
50 - 60	66 - 120	3.00	12.80		0.70	8503037
60 - 104	110 - 220	3.00	12.80		0.80	8503038
90 - 149	155 - 300	3.00	12.80		0.80	8503039
55 - 80	86 - 170	3.00	20.00		0.80	8503124
80 - 150	156 - 310	3.00	20.00		0.80	8502635

As required
by the seal
extrusion gap

For applications
not using a seal
G MAX can
be 1.6mm

NOTE

*G MIN value can be reduced if required by the seal's maximum extrusion gap. Refer to Housing Design section in the front of catalogue. † Within the size range, items suffixed † indicate cross sections to ISO 10766.



506

BEARING

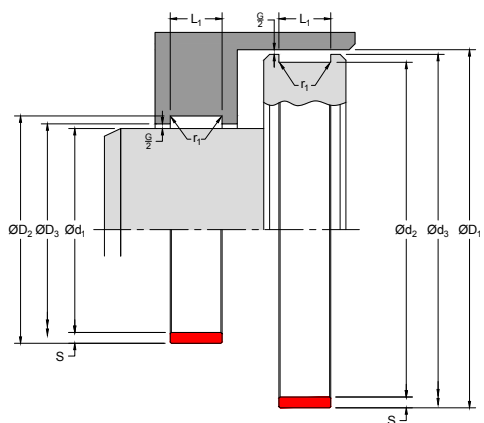
Polyester Fabric, Rod and Piston and Coil

SPIRAL LENGTHS - CONTINUED

METRIC						
Ød ₁	ØD ₁	S	L ₁	G MAX	G MIN*	PART NO.
140 - 250	256 - 510	3.00	20.00	As required by the seal extrusion gap For applications not using a seal G MAX can be 1.6mm	0.80	8503189
50 - 75	81 - 160	3.02	15.00		0.70	8502734
60 - 80	68 - 170	4.00	6.10		0.80	8503359
80 - 150	158 - 310	4.00	6.10		0.80	8503360
150 - 250	258 - 510	4.00	6.10		0.80	8503361
60 - 80	88 - 170	4.00	9.70		0.80	8503362
80 - 150	158 - 310	4.00	9.70		0.80	8503363
150 - 250	258 - 510	4.00	9.70		0.80	8503364
60 - 80	88 - 170	4.00	20.00		0.80	8503365
80 - 150	158 - 310	4.00	20.00		0.80	8503366
150 - 250	258 - 510	4.00	20.00		0.80	8503191
120 - 150	158 - 310	4.00	25.00		0.80	8503367‡
150 - 250	258 - 510	4.00	25.00		0.80	8503192‡
120 - 150	158 - 310	4.00	30.00		0.80	8503368
150 - 250	258 - 510	4.00	30.00		0.80	8503193
170 - 200	208 - 410	4.00	40.10		0.80	8503179
200 - 300	308 - 610	4.00	40.10		0.80	8503180

NOTE

*G MIN value can be reduced if required by the seal's maximum extrusion gap. Refer to Housing Design section in the front of catalogue. ‡ Within the size range, items suffixed ‡ indicate cross sections to ISO 10766.

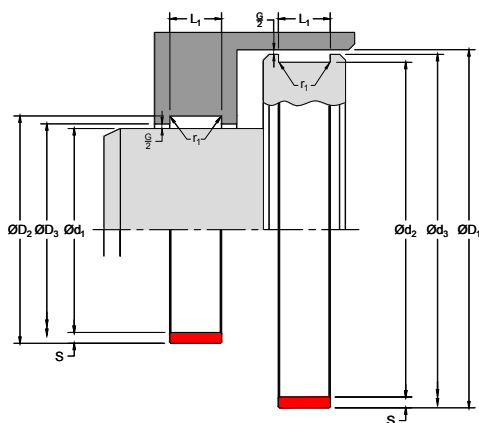


SPIRAL LENGTHS - CONTINUED

INCH						
Ød ₁	ØD ₁	S	L ₁	G MAX	G MIN*	PART NO.
1.000 - 1.375	1.625 - 3.500	0.125	0.375		0.031	8502098
1.250 - 1.875	2.125 - 4.250	0.125	0.375		0.031	8502099
2.000 - 3.500	3.750 - 6.250	0.125	0.375		0.031	8502183
1.250 - 1.750	2.000 - 4.000	0.125	0.500		0.031	8502089
1.750 - 3.500	3.750 - 6.250	0.125	0.500		0.031	8502090
3.500 - 6.000	6.250 - 10.000	0.125	0.500		0.031	8502091
8.000 - 12.500	12.750 - 25.000	0.125	0.500		0.031	8502720
2.000 - 3.500	3.750 - 6.250	0.125	0.625		0.031	8502092
3.500 - 6.000	6.250 - 10.000	0.125	0.625		0.031	8502093
2.000 - 3.500	3.750 - 6.250	0.125	0.750		0.031	8502094
3.500 - 6.000	6.250 - 10.000	0.125	0.750		0.031	8502095
2.500 - 3.500	3.750 - 6.250	0.125	1.000		0.031	8502096
3.500 - 6.000	6.250 - 10.000	0.125	1.000		0.031	8502097
8.000 - 12.500	12.750 - 25.000	0.125	1.000		0.031	8502222

NOTE

*G MIN value can be reduced if required by the seal's maximum extrusion gap. Refer to Housing Design section in front of catalogue.



506

BEARING

Polyester Fabric, Rod and Piston and Coil

FLAT COILS

METRIC						
Ød ₁	ØD ₁	S	L ₁	G MAX	G MIN*	PART NO.
140.00	190.00	1.50	5.60	As required by the seal extrusion gap For applications not using a seal G MAX can be 1.6mm	0.70	8581810
140.00	210.00	2.00	9.70		0.70	8581910
140.00	210.00	2.00	10.00		0.70	8584610
140.00	210.00	2.00	20.00		0.70	8582210
140.00	210.00	2.00	15.00		0.70	8581210
140.00	230.00	2.50	5.60		0.70	8580010‡
140.00	230.00	2.50	6.30		0.70	8581310
140.00	230.00	2.50	8.00		0.70	8581610
140.00	230.00	2.50	9.70		0.70	8580110‡
140.00	230.00	2.50	13.00		0.70	8581110
140.00	230.00	2.50	15.00		0.70	8580210‡
140.00	230.00	2.50	20.00		0.80	8580310
140.00	230.00	2.50	25.00		0.80	8580410‡
140.00	230.00	2.50	30.00		0.70	8582010
140.00	240.00	3.00	9.70		0.70	8581410
140.00	240.00	3.00	12.80		0.70	8581010
140.00	240.00	3.00	20.00		0.70	8581510
140.00	240.00	3.02	15.00		0.70	8581710

NOTE

* G MIN value can be reduced if required by the seal's maximum extrusion gap. Refer to Housing Design section in the front of catalogue. ‡ Within the size range, items suffixed ‡ indicate cross sections to ISO 10766.

INCH						
Ød ₁	ØD ₁	S	L ₁	G MAX	G MIN*	PART NO.
5.500	9.750	0.125	0.375	As required by the seal extrusion gap	0.031	8580510
5.500	9.750	0.125	0.500		0.031	8580610
5.500	9.750	0.125	0.625	For applications not using a seal, G MAX can be 0.080in	0.031	8580710
5.500	9.750	0.125	0.750		0.031	8580810
5.500	9.750	0.125	1.000		0.031	8580910

NOTE

* G MIN value can be reduced if required by the seal's maximum extrusion gap. Refer to Housing Design section in front of catalogue.

NOTE

For a comprehensive list of all Hallite 506 cut ring sizes and part numbers for rod and piston applications, please refer to the Hallite website.





Glass-Filled Nylon, Piston and Rod

The Hallite 533 is available in molded rings. The rectangular section strip is available in a wide range of inch and some metric sizes which are available upon request. If you cannot find the size you are looking for, please contact your local Hallite sales office for additional size information.



- Moulded to size
- Robust
- Long life
- Economical
- Easy to install

As standard, this product comes in the following material. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Colour
Standard	PA 533	PA-GF	Black

TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	5.0 m/sec	16.0 ft/sec
Temperature Range	-40 +120°C	-40 +250°F

NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

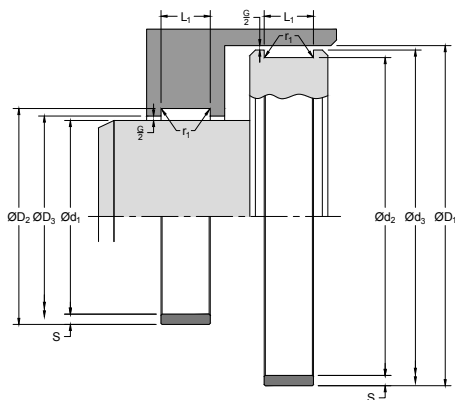
SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face - Rod $\varnothing d_1$	0.40	1.6 max	4 max	16	63 max	157 max
Static Sealing Face - Rod $\varnothing D_2, L_1$	3.2 max	10 max	16 max	125 max	394 max	630 max
Dynamic Sealing Face - Piston $\varnothing d_1, L_1$	0.40	1.6 max	4 max	16	63 max	157 max
Static Sealing Face - Rod $\varnothing D_2, L_1$	3.2 max	10 max	16 max	125 max	394 max	630 max

TYPICAL PHYSICAL PROPERTIES	TEST METHOD	METRIC	INCH
Tensile Strength at Yield	ASTM D638	186 MPa	27000 psi
Elongation at Break	ASTM D638	3.00%	3.00%
Flexural Strength at Yield	ASTM D790	262 MPa	38000 psi
Flexural Modulus	ASTM D790	8965 MPa	1300000 psi
Izod Impact	ASTM D256	112 J/m	2.1 ft-lb/in
Specific Gravity	ASTM D792	1.41	1.41
Compressive Strength	ASTM D695	176 MPa	25500 psi
Water Absorption	ASTM D570	0.70%	0.70%
Hardness - Rockwell	ASTM D785	120 R	120 R
Deformation Under Load @ 4000 psi	ASTM D621	0.80%	0.80%
Shear Strength	ASTM D732	86 MPa	12500 psi

HOUSING DETAILS & TOLERANCES				
Rod	$\varnothing d_1$ mm	f9	$\varnothing d_1$ in	f9
	$\varnothing D_2 = \varnothing d_1 + 2S$ mm	$\leq \varnothing 80$ H10 $> \varnothing 80$ H9	$\varnothing D_2 = \varnothing d_1 + 2S$ in	+0.004 -0
	$\varnothing D_3 = \varnothing d_1 + G$ mm	-	$\varnothing D_3 = \varnothing d_1 + G$ in	-
Piston	$\varnothing D_1$ mm	H11	$\varnothing D_1$ in	H11
	$\varnothing d_2 = \varnothing D_1 - 2S$ mm	h9	$\varnothing d_2 = \varnothing D_1 - 2S$ in	+0.000 -0.0004
	$\varnothing d_3 = \varnothing D_1 - G$ mm	-	$\varnothing d_3 = \varnothing D_1 - G$ in	-

RADIAL CLEARANCE RECOMMENDATIONS

NOMINAL CROSS SECTIONS	G max	G min
S = 3.00 mm	2.00 mm	0.08 mm
S = 2.50 mm	1.50 mm	0.08 mm
S = 0.126 in (1/8 in)	0.080 in	0.031 in
S = 0.093 in (3/32 in)	0.080 in	0.031 in



533

BEARING

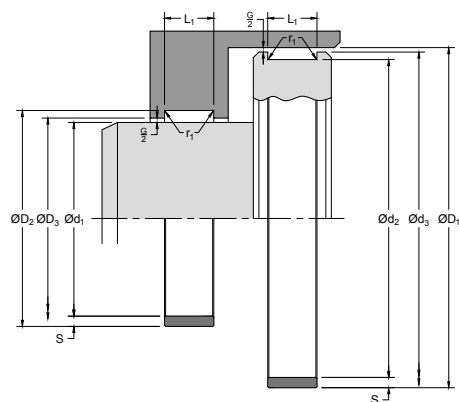
*Glass-Filled
Nylon, Piston and Rod*

PART NUMBER RANGE

INCH			
ØD ₁ , ØD ₂	Ød ₂ , Ød ₁	L ₁	PART No.
1.250	1.000	1.000	F30220
1.500	1.250	0.250	F30005
1.500	1.250	0.375	F30006
1.500	1.250	0.500	F30305
1.500	1.312	0.187	F30004
1.500	1.312	0.375	F30352
1.750	1.500	0.190	F30234
1.750	1.500	0.375	F30201
1.750	1.500	0.500	F30013
1.875	1.625	0.190	F30179
1.875	1.625	0.375	F30235
1.875	1.625	0.500	F30306
2.000	1.750	0.187	F40001
2.000	1.750	0.250	F30018
2.000	1.750	0.312	F30020
2.000	1.750	0.375	F30022
2.000	1.750	0.500	F30024
2.000	1.750	0.750	F30025
2.000	1.812	0.375	F30325
2.125	1.875	0.375	F20026
2.250	2.000	0.187	F40029
2.250	2.000	0.250	F30196
2.250	2.000	0.312	F30032
2.250	2.000	0.375	F30033
2.250	2.000	0.500	F30035
2.250	2.000	0.625	F30036
2.250	2.000	0.750	F30037
2.375	2.125	0.500	F30038
2.500	2.250	0.187	F30040
2.500	2.250	0.250	F30041
2.500	2.250	0.312	F30043
2.500	2.250	0.375	F30044

NOTE

For complete size list, please visit Hallite.com.

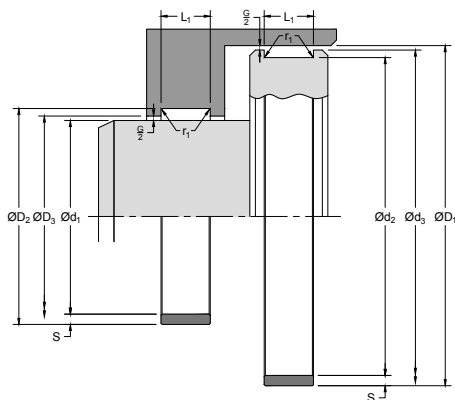


PART NUMBER RANGE

INCH			
$\text{ØD}_1, \text{ØD}_2$	$\text{Ød}_2, \text{Ød}_1$	L_1	PART No.
2.500	2.250	0.500	F30045
2.500	2.250	0.625	F30047
2.500	2.250	0.750	F30048
2.500	2.250	1.000	F30286
2.500	2.312	0.375	F30326
2.625	2.375	0.375	F20179
2.625	2.375	0.625	F30285
2.750	2.500	0.250	F30209
2.750	2.500	0.375	F30051
2.750	2.500	0.500	F30052
2.750	2.500	0.625	F30054
2.750	2.500	0.750	F30055
2.750	2.500	1.000	F30056
3.000	2.750	0.250	F30061
3.000	2.750	0.312	F30062
3.000	2.750	0.375	F30063
3.000	2.750	0.500	F30064
3.000	2.750	0.625	F30191
3.000	2.750	0.750	F30066
3.000	2.750	1.000	F30067
3.000	2.812	0.375	F30327
3.250	3.000	0.250	F30207
3.250	3.000	0.312	F30259
3.250	3.000	0.375	F30069
3.250	3.000	0.500	F30070
3.250	3.000	0.625	F30287
3.250	3.000	0.750	F30072
3.250	3.000	1.000	F30074
3.250	3.062	0.375	F30353
3.500	3.250	0.250	F30079
3.500	3.250	0.312	F30255
3.500	3.250	0.375	F30080

NOTE

For complete size list, please visit Hallite.com.



533

BEARING

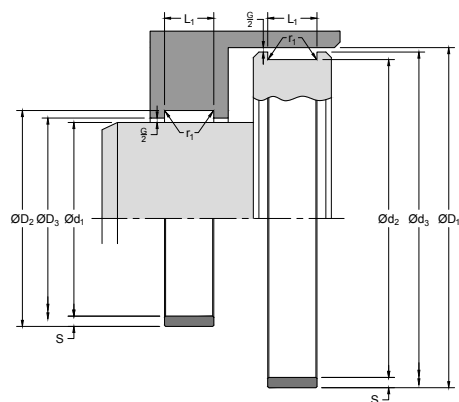
*Glass-Filled
Nylon, Piston and Rod*

PART NUMBER RANGE

INCH			
ØD ₁ , ØD ₂	Ød ₂ , Ød ₁	L ₁	PART No.
3.500	3.250	0.500	F30083
3.500	3.250	0.625	F30085
3.500	3.250	0.750	F30087
3.500	3.250	1.000	F30275
3.500	3.312	0.375	F30328
3.625	3.375	0.500	F30090
3.625	3.375	1.000	F30091
3.750	3.500	0.250	F40027
3.750	3.500	0.312	F30260
3.750	3.500	0.375	F30092
3.750	3.500	0.500	F30093
3.750	3.500	0.625	F30094
3.750	3.500	0.750	F30095
4.000	3.750	0.250	F30100
4.000	3.750	0.312	F30256
4.000	3.750	0.375	F30101
4.000	3.750	0.500	F30102
4.000	3.750	0.625	F30104
4.000	3.750	0.750	F30105
4.000	3.750	1.000	F30219
4.250	4.000	0.312	F30261
4.250	4.000	0.375	F30107
4.250	4.000	0.500	F30108
4.250	4.000	0.625	F30109
4.250	4.000	0.750	F30110
4.250	4.000	1.000	F30112
4.500	4.250	0.312	F30262
4.500	4.250	0.375	F30114
4.500	4.250	0.500	F30115
4.500	4.250	0.625	F30118
4.500	4.250	0.750	F30120
4.500	4.250	1.000	F30278

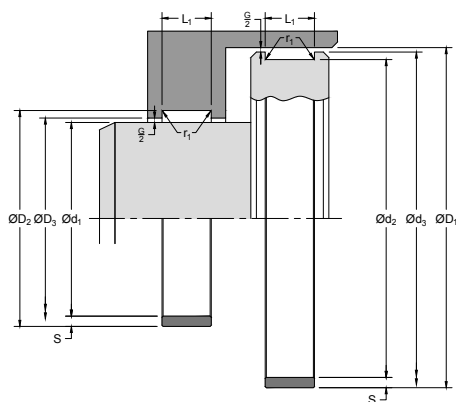
NOTE

For complete size list, please visit Hallite.com.



PART NUMBER RANGE

INCH			
$\text{ØD}_1, \text{ØD}_2$	$\text{Ød}_2, \text{Ød}_1$	L_1	PART No.
4.750	4.500	0.375	F30194
4.750	4.500	0.500	F30121
4.750	4.500	0.750	F30123
4.750	4.500	1.000	F30124
5.000	4.750	0.375	F30126
5.000	4.750	0.500	F30127
5.000	4.750	0.625	F30128
5.000	4.750	0.750	F30129
5.000	4.750	1.000	F30169
5.250	5.000	0.500	F30131
5.250	5.000	0.625	F30132
5.250	5.000	0.750	F30133
5.250	5.000	1.000	F30269
5.500	5.250	0.375	F30135
5.500	5.250	0.500	F30136
5.500	5.250	0.625	F30138
5.500	5.250	0.750	F30140
5.500	5.250	1.000	F30141
5.750	5.500	0.750	F30143
5.750	5.500	1.000	F30144
6.000	5.750	0.500	F30145
6.000	5.750	0.625	F30147
6.000	5.750	0.750	F30208
6.000	5.750	1.000	F30149
6.250	6.000	0.500	F30279
6.250	6.000	0.625	F30151
6.250	6.000	0.750	F30152
6.250	6.000	1.000	F30153
6.500	6.250	0.500	F30154
6.500	6.250	0.750	F30199
6.500	6.250	1.000	F30157
6.750	6.500	1.000	F30276
NOTE		For complete size list, please visit Hallite.com .	



533

BEARING

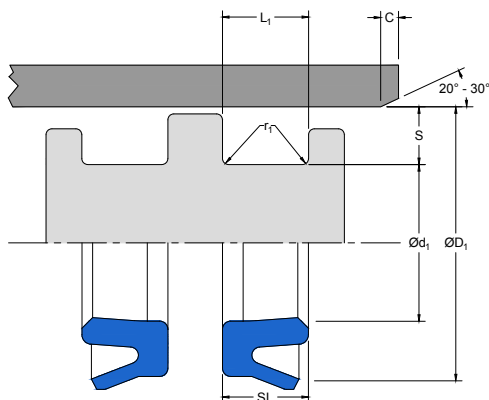
*Glass-Filled
Nylon, Piston and Rod*

PART NUMBER RANGE

INCH			
ØD ₁ , ØD ₂	Ød ₂ , Ød ₁	L ₁	PART No.
7.000	6.750	0.500	F30158
7.000	6.750	0.625	F30159
7.000	6.750	0.750	F30277
7.000	6.750	1.000	F30160
7.250	7.000	0.500	F30281
7.250	7.000	0.750	F30284
7.250	7.000	1.000	F30289
7.500	7.250	0.500	F30162
7.500	7.250	0.750	F30165
7.500	7.250	1.000	F30166
7.750	7.500	0.500	F20160
7.750	7.500	1.000	F30247
8.000	7.750	1.000	F30231
8.250	8.000	1.000	F30248
8.500	8.250	0.500	F30168
8.500	8.250	1.000	F30246
8.750	8.500	1.000	F30249
9.000	8.750	1.000	F30230
9.250	9.000	1.000	F30253
9.500	9.250	1.000	F30254
9.750	9.500	1.000	F30250
10.000	9.750	1.000	F30221
10.250	10.000	1.000	F30258
10.500	10.250	1.000	F30257
11.000	10.750	1.000	F30222
11.250	11.000	1.000	F30251
11.500	11.250	1.000	F30252
12.000	11.750	1.000	F30223
13.000	12.750	1.000	F30224
NOTE		For complete size list, please visit Hallite.com .	



PNEUMATIC SEALS



607

PNEUMATIC SEAL

*Single-Acting
Polyurethane Piston Seal*

DESIGN

The Hallite 607 single-acting piston seal for pneumatic applications is designed to give significant improvements in cylinder performance in low lube air conditions and to be used in long and short stroke applications. The Hallite 607 is well proven in heavy-duty pneumatic applications, such as logging and forestry equipment.

The Hallite 607 is manufactured in Hythane® 181, Hallite's high-performance polyurethane, for easy installation, excellent low temperature performance, and long service life.

The material combined with the design of the dynamic sealing lip offers low friction, significantly less than that of a rubber seal, and an ultra-long life.

The Hallite 607 may be used in single-acting cylinders with a spring return as well as back-to-back as in the double-acting application illustrated in the housing diagram.



FEATURES

- Ultra long life
- Effective seal
- Low friction
- Hard wearing
- Excellent temperature range
- Easy to install

MATERIALS

As standard, this product comes in the following material. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color
Standard	Hythane® 181	TPU-EU	Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/ sec	3.0 ft/ sec
Temperature Range	-45°C +80°C	-50°F +180°F
Maximum Pressure	16 bar	230 psi

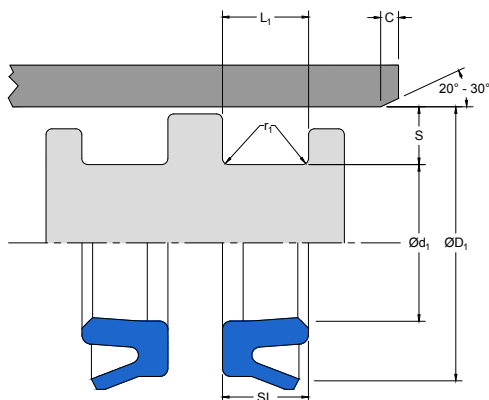
NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

SURFACE ROUGHNESS	µmRa	µmRz	µmRt	µinRa	µinRz	µinRt
Dynamic Sealing Face ØD ₁	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face Ød ₁	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L ₁	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII					
Groove Section ≤ S mm	4.00	5.00	7.50		
Min Chamfer C mm	3.00	3.50	5.00		
Max Fillet Rad r ₁ mm	0.20	0.40	0.80		
Groove Section ≤ S in	0.125	0.187	0.250	0.312	0.375
Min Chamfer C in	0.093	0.093	0.125	0.156	0.187
Max Fillet Rad r ₁ in	0.008	0.008	0.016	0.016	0.032

TOLERANCES	ØD ₁	Ød ₁	L ₁
mm	H11	js11	+0.25 -0
in	H11	js11	+0.010 -0



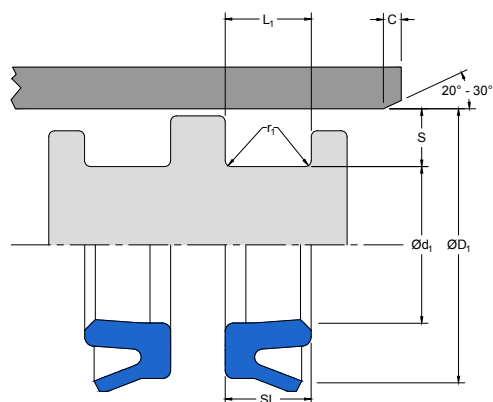
607

PNEUMATIC SEAL

*Single-Acting
Polyurethane Piston Seal*

PART NUMBER RANGE

INCH						
ØD ₁	TOL H11	Ød ₁	TOL js11	SL	L ₁ +0.010-0	PART No.
1.500	+0.006 0.000	1.187	+0.003 -0.003	0.156	0.172	4517800
1.500	+0.006 0.000	1.250	+0.003 -0.003	0.125	0.138	4517900
1.625	+0.006 0.000	1.250	+0.003 -0.003	0.187	0.218	4591700
2.000	+0.007 0.000	1.625	+0.003 -0.003	0.187	0.218	4591800
2.000	+0.007 0.000	1.750	+0.003 -0.003	0.125	0.138	4518000
2.500	+0.007 0.000	2.125	+0.004 -0.004	0.187	0.207	4518100
3.000	+0.007 0.000	2.375	+0.004 -0.004	0.312	0.344	4419400
3.000	+0.007 0.000	2.500	+0.004 -0.004	0.250	0.275	4518200
3.250	+0.009 0.000	2.750	+0.004 -0.004	0.250	0.275	4518300
3.250	+0.009 0.000	2.812	+0.004 -0.004	0.225	0.250	4591900
4.000	+0.009 0.000	3.250	+0.004 -0.004	0.375	0.413	4447700
4.000	+0.009 0.000	3.500	+0.004 -0.004	0.250	0.275	4518400
5.000	+0.010 0.000	4.250	+0.004 -0.004	0.375	0.413	4447800
5.000	+0.010 0.000	4.500	+0.004 -0.004	0.250	0.275	4560200
6.000	+0.010 0.000	5.125	+0.005 -0.005	0.437	0.480	4420500
6.000	+0.010 0.000	5.375	+0.005 -0.005	0.312	0.344	4518500
6.000	+0.010 0.000	5.500	+0.005 -0.005	0.250	0.275	4518600

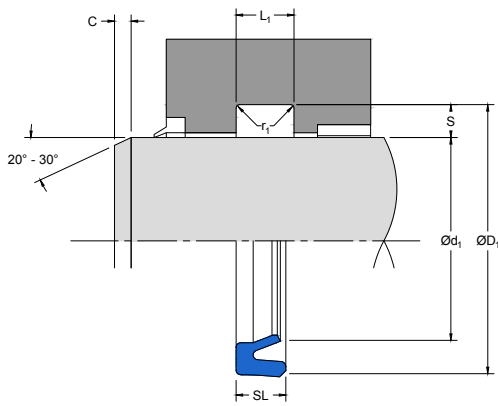


PART NUMBER RANGE

INCH						
ØD ₁	TOL H11	Ød ₁	TOL js11	SL	L ₁ +0.010-0	PART No.
7.000	+0.010 0.000	6.250	+0.005 -0.005	0.375	0.413	4518700
7.000	+0.010 0.000	6.375	+0.005 -0.005	0.312	0.344	4518800
8.000	+0.012 0.000	7.250	+0.006 -0.006	0.375	0.413	4421000
8.000	+0.012 0.000	7.375	+0.006 -0.006	0.312	0.344	4518900
8.000	+0.012 0.000	7.500	+0.006 -0.006	0.250	0.275	4519000
10.000	+0.013 0.000	9.250	+0.006 -0.006	0.375	0.413	4422600
12.000	+0.013 0.000	11.250	+0.006 -0.006	0.375	0.413	4422700

METRIC						
ØD ₁	TOL H11	Ød ₁	TOL js11	SL	L ₁ +0.010-0	PART No.
32.00	+0.16 0.00	24.00	+0.07 -0.07	5.80	6.50	4366200
40.00	+0.16 0.00	29.70	+0.07 -0.07	7.10	8.00	4337900
40.00	+0.16 0.00	30.00	+0.07 -0.07	6.80	7.60	4366300
50.00	+0.16 0.00	40.00	+0.08 -0.08	7.10	8.50	4326200
63.00	+0.19 0.00	53.00	+0.10 -0.10	7.10	8.50	4366400
80.00	+0.19 0.00	70.00	+0.10 -0.10	7.10	8.50	4366500
100.00	+0.22 0.00	85.00	+0.11 -0.11	9.10	10.40	4366600





609

PNEUMATIC SEAL

*Single-Acting
Polyurethane Rod Seal*

DESIGN

The Hallite 609 single-acting rod seal for pneumatic applications is designed to give significant improvements in cylinder performance in low lube air conditions and to be used in long and short stroke applications. The Hallite 609 is well proven in heavy-duty pneumatic applications, such as logging and forestry equipment.

The Hallite 609 is manufactured in Hythane® 181, Hallite's high-performance polyurethane, for easy installation, excellent low temperature performance, and long service life.

The material combined with the design of the dynamic sealing lip offers low friction, significantly less than that of a rubber seal, and an ultra-long life.



FEATURES

- Ultra-long life
- Effective seal
- Low friction
- Hard wearing
- Excellent temperature range
- Easy to install

MATERIALS

As standard, this product comes in the following material. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color
Standard	Hythane® 181	TPU-EU	Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/ sec	3.0 ft/sec
Temperature Range	-45°C +80°C	-50°F +180°F
Maximum Pressure	16 bar	230 psi

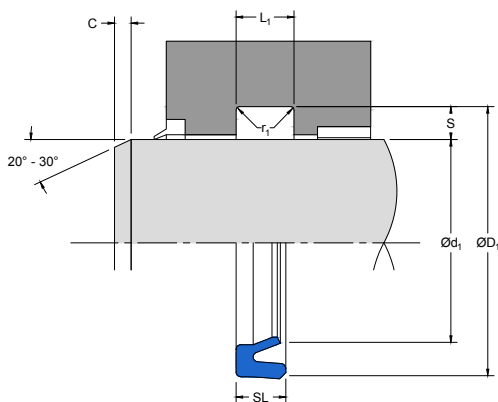
NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

SURFACE ROUGHNESS	µmRa	µmRz	µmRt	µinRa	µinRz	µinRt
Dynamic Sealing Face $\varnothing d_1$	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face $\varnothing D_1$	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII			
Groove Section $\leq S$ mm	4.00	5.00	
Min Chamfer C mm	3.00	3.50	
Max Fillet Rad r_1 mm	0.20	0.40	
Groove Section $\leq S$ in	0.125	0.187	0.250
Min Chamfer C in	0.093	0.093	0.125
Max Fillet Rad r_1 in	0.008	0.008	0.016

TOLERANCES	$\varnothing d_1$	$\varnothing D_1$	L_1
mm	f9	js11	+0.25 -0
in	f9	js11	+0.010 -0



609

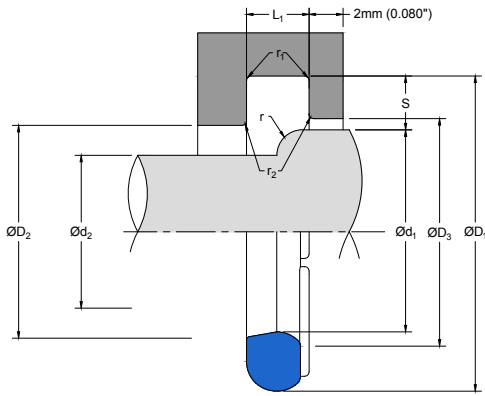
PNEUMATIC SEAL

*Single-Acting
Polyurethane Rod Seal*

PART NUMBER RANGE

INCH						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
0.625	-0.001 -0.002	0.875	+0.003 -0.003	0.250	0.275	4490200
0.750	-0.001 -0.003	1.000	+0.003 -0.003	0.250	0.275	4541700
1.000	-0.001 -0.003	1.240	+0.003 -0.003	0.187	0.207	4541800
1.000	-0.001 -0.003	1.250	+0.003 -0.003	0.250	0.275	4471000
1.125	-0.001 -0.003	1.375	+0.003 -0.003	0.187	0.207	4598300
1.250	-0.001 -0.003	1.500	+0.003 -0.003	0.250	0.275	4541900
1.375	-0.001 -0.003	1.625	+0.003 -0.003	0.250	0.275	4542000
1.500	-0.001 -0.003	1.875	+0.003 -0.003	0.250	0.275	4542100
1.750	-0.001 -0.003	2.125	+0.004 -0.004	0.312	0.344	4542200
2.000	-0.001 -0.004	2.250	+0.004 -0.004	0.250	0.275	4543800
2.000	-0.001 -0.004	2.375	+0.004 -0.004	0.312	0.344	4483200
2.000	-0.001 -0.004	2.625	+0.004 -0.004	0.312	0.344	4499200
2.500	-0.001 -0.004	3.000	+0.004 -0.004	0.284	0.312	4542300

METRIC						
Ød ₁	TOL f9	ØD ₁	TOL Js11	SL	L ₁ +0.010-0	PART No.
12.00	-0.02 -0.06	19.00	+0.07 -0.07	4.50	5.00	4510100
16.00	-0.02 -0.06	22.00	+0.07 -0.07	4.00	4.50	4510200
20.00	-0.02 -0.07	28.00	+0.07 -0.07	5.50	6.00	4484300
25.00	-0.02 -0.07	35.00	+0.08 -0.08	7.50	8.00	4510300
32.00	-0.03 -0.09	42.00	+0.08 -0.08	7.00	7.50	4510400



661

PNEUMATIC SEAL

Polyurethane Cushion Seal

DESIGN

The Hallite 661 polyurethane cushion seal for pneumatic applications is designed to cushion the stroke of the piston in pneumatic cylinders by acting as a non-return valve.

Near the end of the cylinder stroke the cushion spear enters the seal and pushes it against the radial housing wall to trap air between it and the piston decelerating the piston in the process. When pressure is applied to the system to return the piston, specially designed venting grooves allow pressure to pass over the Hallite 661 to the piston.

The Hallite 661 is manufactured in Hythane® 181, Hallite's high-performance polyurethane, for easy installation, excellent low temperature performance, and long service life.



FEATURES

- Non-return valve action
- Excellent temperature range
- Hard wearing
- Easy to install

MATERIALS

As standard, this product comes in the following material. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color
Standard	Hythane® 181	TPU-EU	Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-45°C +80°C	-50°F +180°F
Maximum Pressure	16 bar	230 psi

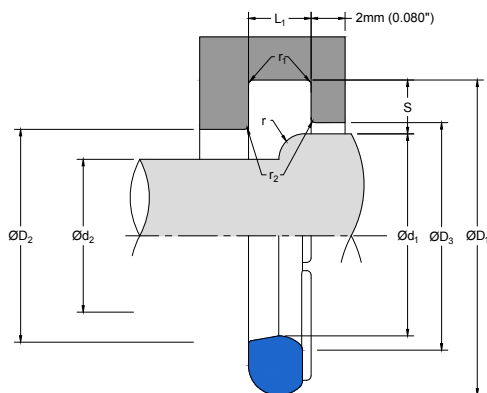
NOTE

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SURFACE ROUGHNESS	µmRa	µmRz	µmRt	µinRa	µinRz	µinRt
Dynamic Sealing Face Ød ₁	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face ØD ₁	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L ₁	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII				
Groove Section ≤ S mm	3.00	4.00	5.00	7.00
Max Rad r mm	3.00	4.00	4.00	5.00
Max Fillet Rad r ₁ mm	0.40	0.40	0.40	0.40
Max Fillet Rad r ₂ mm	0.20	0.20	0.20	0.20
Groove Section ≤ S in	0.157	0.197		
Max Rad r in	0.118	0.157		
Max Fillet Rad r ₁ in	0.016	0.016		
Max Fillet Rad r ₂ in	0.008	0.008		

TOLERANCES	Ød ₁	ØD ₁	ØD ₂	ØD ₃	L ₁
mm	h10	H11	H11	H11	+0.20 -0.20
in	h10	H11	H11	H11	+0.016 -0



661

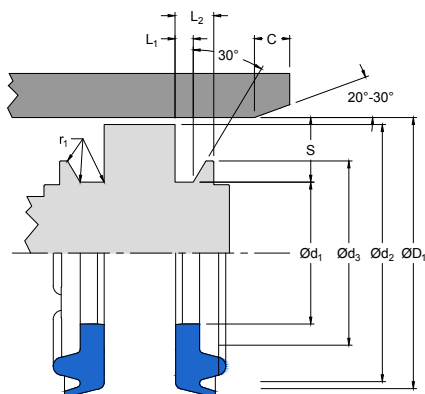
PNEUMATIC SEAL

Polyurethane Cushion Seal

PART NUMBER RANGE

INCH										
MAX ROD DIA $\varnothing d_2$	SPEAR DIA $\varnothing d_1$	TOL h10	$\varnothing D_1$	TOL H11	$\varnothing D_2$	TOL H11	$\varnothing D_3$	TOL H11	L_1 +0.20-0.20	PART No.
0.719	0.880	0.000 -0.004	1.195	+0.006 0.000	0.900	+0.005 0.000	0.959	+0.005 0.000	0.189	8907300
1.094	1.253	0.000 -0.004	1.568	+0.006 0.000	1.273	+0.006 0.000	1.332	+0.006 0.000	0.189	8907400
1.469	1.624	0.000 -0.004	1.939	+0.006 0.000	1.644	+0.006 0.000	1.703	+0.006 0.000	0.189	8907500

METRIC										
MAX ROD DIA $\varnothing d_2$	SPEAR DIA $\varnothing d_1$	TOL h10	$\varnothing D_1$	TOL H11	$\varnothing D_2$	TOL H11	$\varnothing D_3$	TOL H11	L_1 +0.016 -0	PART No.
7.00	10.00	0.00 -0.06	18.00	+0.11 0.00	10.50	+0.11 0.00	12.00	+0.11 0.00	4.80	4574800
13.00	16.00	0.00 -0.07	24.00	+0.13 0.00	16.50	+0.11 0.00	18.00	+0.11 0.00	4.80	4558500
18.00	22.00	0.00 -0.08	30.00	+0.13 0.00	22.50	+0.13 0.00	24.00	+0.13 0.00	4.80	4574900
24.00	28.00	0.00 -0.08	38.00	+0.16 0.00	28.60	+0.13 0.00	30.00	+0.13 0.00	6.00	4574400
28.00	32.00	0.00 -0.10	42.00	+0.16 0.00	32.60	+0.16 0.00	34.00	+0.16 0.00	6.00	4591400
34.00	38.00	0.00 -0.10	48.00	+0.16 0.00	38.60	+0.16 0.00	40.00	+0.16 0.00	6.00	4574500
46.00	50.00	0.00 -0.10	60.00	+0.19 0.00	50.60	+0.19 0.00	52.00	+0.19 0.00	6.00	4558600
56.00	60.00	0.00 -0.12	74.00	+0.19 0.00	60.60	+0.19 0.00	63.00	+0.19 0.00	8.40	4574600
66.00	70.00	0.00 -0.12	84.00	+0.22 0.00	70.60	+0.19 0.00	73.00	+0.19 0.00	8.40	4576000
76.00	80.00	0.00 -0.12	94.00	+0.22 0.00	80.60	+0.22 0.00	83.00	+0.22 0.00	8.40	4574700
96.00	100.00	0.00 -0.14	114.00	+0.22 0.00	100.60	+0.22 0.00	103.00	+0.22 0.00	8.40	4582700



667

PNEUMATIC SEAL

*Single-Acting
Polyurethane Piston Seal
with Bump Stop*

DESIGN

The Hallite 667 polyurethane, single-acting piston seal for pneumatic applications design incorporates buffers to provide additional cushioning for pneumatic cylinders to prevent metal-to-metal contact at the end of the stroke, particularly if the retardation of the piston by the pneumatic cushion is insufficient. In turn, this additional buffering will reduce end stroke noise.

The Hallite 667 is manufactured in Hythane® 181, Hallite's high-performance polyurethane, for easy installation, excellent low temperature performance, and long service life.

The material combined with the design of the dynamic sealing lip offers low friction, significantly less than that of a rubber seal, and an ultra-long life.



FEATURES

- Ultra-long life
- Reduces cylinder noise
- Effective seal
- Low friction
- Hard wearing
- Excellent temperature range
- Easy to install

MATERIALS

As standard, this product comes in the following material. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color
Standard	Hythane® 181	TPU-EU	Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	1.0 m/sec	3.0 ft/sec
Temperature Range	-45°C +80°C	-50°F +180°F
Maximum Pressure	16 bar	230 psi

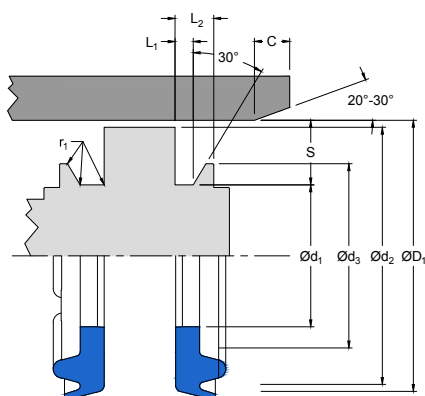
NOTE

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SURFACE ROUGHNESS	μmRa	μmRz	μmRt	μinRa	μinRz	μinRt
Dynamic Sealing Face ØD_1	0.1 - 0.4	1.6 max	4 max	4-16	63 max	157 max
Static Sealing Face Ød_1	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L_1	3.2 max	10 max	16 max	125 max	394 max	630 max

RADII		
Groove Section $\leq S$ in	0.500	0.750
Min Chamfer C in	0.270	0.315
Max Fillet Rad r_1 in	0.016	0.016

TOLERANCES	ØD_1	Ød_1	Ød_2	Ød_3	L_1	L_2
in	+0.005-0	+0-0.005	+0-0.002	+0-0.005	+0-0.005 -0	±0.005



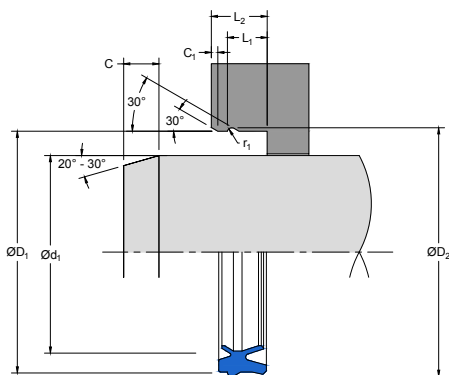
667

PNEUMATIC SEAL

*Single-Acting
Polyurethane Piston Seal
with Bump Stop*

PART NUMBER RANGE

INCH						PART No.
ØD_1 +0.002-0	Ød_1 +0-0.005	Ød_2 +0-0.002	Ød_3 +0-0.005	L_1 +0.005-0	L_2 ±0.005	
1.500	0.810	1.498	1.050	0.138	0.256	4788800
2.000	1.202	1.998	1.440	0.138	0.256	4779800
2.500	1.640	2.498	1.925	0.157	0.315	4884300
3.250	2.150	3.247	2.550	0.157	0.315	4788900
4.000	2.810	3.995	3.268	0.157	0.315	4789000
5.000	3.525	4.995	4.095	0.197	0.375	4789100
6.000	4.525	5.995	5.095	0.197	0.375	4875100
8.000	6.525	7.995	7.095	0.197	0.375	4875200



851

PNEUMATIC SEAL

*Single-Acting
Polyurethane
Combined Rod Seal and Wiper*



DESIGN

The Hallite 851 high-performance rod seal and wiper combination is designed specifically for pneumatic applications and to give significant improvements in cylinder performance in low lube air conditions and be used in long and short stroke applications.

The Hallite 851 is manufactured in Hythane® 181, Hallite's high-performance polyurethane, for easy installation, excellent low temperature performance, and long service life.

The material combined with the design of the dynamic sealing lip offers low friction, significantly less than that of a rubber seal, and an ultra-long life.

FEATURES

- Combined rod seal and wiper
- Ultra-long life
- Effective seal
- Low friction
- Hard wearing
- Excellent temperature range
- Easy to install

MATERIALS

As standard, this product comes in the following material. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color
Standard	Hythane® 181	TPU-EU	Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	0.1 m/sec	0.3 ft/sec
Temperature Range	-45°C +80°C	-50°F +180°F
Maximum Pressure	10 bar	150 psi

NOTE

Not designed for scraping ice

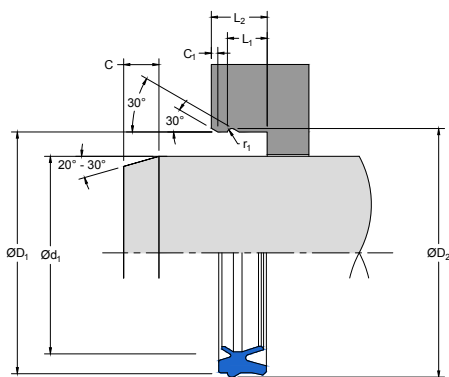
NOTE

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SURFACE ROUGHNESS	µmRa	µmRz	µmRt	µinRa	µinRz	µinRt
Dynamic Sealing Face Ød ₁	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face ØD ₁	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L ₁	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII		
Rod Diameter Ød, mm	≤20	>20
Min Chamfer C mm	3.50	3.50
Min Chamfer C ₁ mm	1.50	2.00
Max Fillet Rad r ₁ mm	1.10	1.40

TOLERANCES	Ød ₁	ØD ₁	ØD ₂	L ₁	L ₂
mm	f9	H10	±0.10	+0.25 -0	+0.50 -0



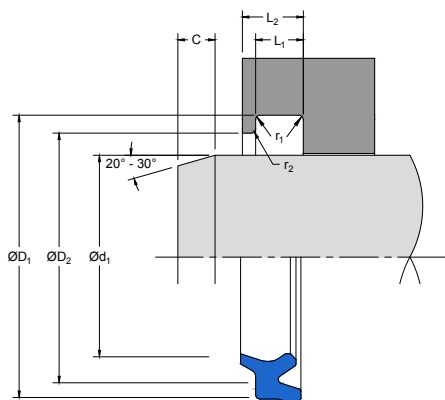
851

PNEUMATIC SEAL

*Single-Acting
Polyurethane
Combined Rod Seal and Wiper*

PART NUMBER RANGE

METRIC								
Ød ₁	TOL f9	ØD ₁	TOL H10	ØD ₂	TOL	L ₁ +0.25 -0	L ₂ +0.50 -0	PART No.
12.00	-0.016 -0.059	22.00	+0.08 0.00	24.00	+0.10 -0.10	8.80	13.00	4442000
16.00	-0.016 -0.059	26.00	+0.08 0.00	28.00	+0.10 -0.10	8.80	13.00	4453900
20.00	-0.020 -0.072	30.00	+0.08 0.00	32.00	+0.10 -0.10	8.80	13.00	4404700
25.00	-0.020 -0.072	35.00	+0.10 0.00	37.50	+0.10 -0.10	9.40	14.00	4427600



853

PNEUMATIC SEAL

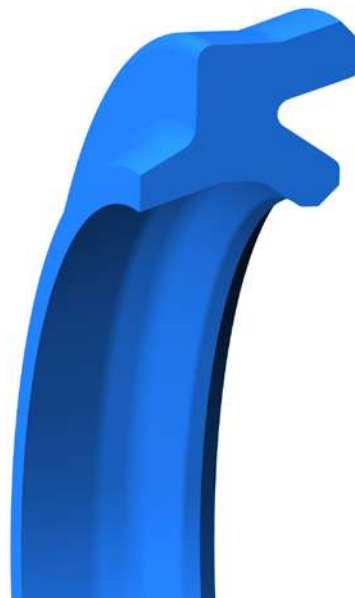
*Single-Acting
Polyurethane
Combined Rod Seal and Wiper*

DESIGN

The Hallite 853 high-performance rod seal and wiper combination is designed specifically for pneumatic applications and to give significant improvements in cylinder performance in low lube air conditions and be used in long and short stroke applications.

The Hallite 853 is manufactured in Hythane® 181, Hallite's high-performance polyurethane, for easy installation, excellent low temperature performance, and long service life.

The material combined with the design of the dynamic sealing lip offers low friction, significantly less than that of a rubber seal, and an ultra-long life.



FEATURES

- Combined rod seal and wiper
- Ultra-long life
- Effective seal
- Low friction
- Hard wearing
- Excellent temperature range
- Easy to install

MATERIALS

As standard, this product comes in the following material. Contact your local Hallite technical team if you would like to find out if this profile can be made in a custom material to suit your application. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color
Standard	Hythane® 181	TPU-EU	Blue



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	0.1 m/sec	0.3 ft/sec
Temperature Range	-45°C +80°C	-50°F +180°F
Maximum Pressure	16 bar	230 psi

NOTE

Not designed for scraping ice

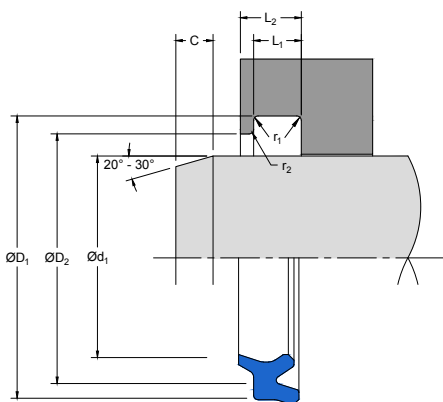
NOTE

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SURFACE ROUGHNESS	µmRa	µmRz	µmRt	µinRa	µinRz	µinRt
Dynamic Sealing Face Ød ₁	0.1 - 0.4	1.6 max	4 max	4 - 16	63 max	157 max
Static Sealing Face ØD ₁ , ØD ₂	1.6 max	6.3 max	10 max	63 max	250 max	394 max
Static Housing Faces L ₁	3.2 max	10 max	16 max	125 max	394 max	630 max

CHAMFERS & RADII		
Groove Section ≤S mm	3.00	4.00
Min Chamfer C mm	2.50	3.00
Max Fillet Rad r ₁ mm	0.20	0.20
Max Fillet Rad r ₂ mm	0.40	0.40

TOLERANCES	Ød ₁	ØD ₁	ØD ₂	L ₁
mm	f9	H11	H11	+0.20 -0



853

PNEUMATIC SEAL

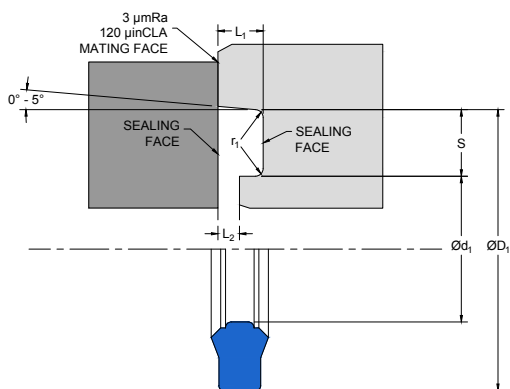
*Single-Acting
Polyurethane
Combined Rod Seal and Wiper*

PART NUMBER RANGE

METRIC								
Ød ₁	TOL f9	ØD ₁	TOL H11	ØD ₂	TOL H11	L ₁ +0.20 -0	L ₂	PART No.
10.00	-0.013 -0.049	16.00	+0.110 0.000	12.50	+0.110 0.000	4.00	7.00	4372800
12.00	-0.016 -0.059	18.00	+0.130 0.000	14.50	+0.110 0.000	4.00	7.00	4467700
14.00	-0.016 -0.059	20.00	+0.130 0.000	16.50	+0.110 0.000	4.00	7.00	4467800
20.00	-0.020 -0.072	26.00	+0.130 0.000	22.50	+0.130 0.000	4.00	7.00	4467900
25.00	-0.020 -0.072	31.00	+0.160 0.000	27.50	+0.130 0.000	4.00	7.00	4372900
32.00	-0.025 -0.087	40.00	+0.160 0.000	35.00	+0.160 0.000	5.00	8.00	4468000



ADDITIONAL PRODUCTS



657

ADDITIONAL PRODUCT

*Polyurethane Flange Seal for
SAE J518 Type Flanges*

DESIGN

The Hallite 657 flange seal is designed to fit SAE J518 flanges.

The Hallite 657 overcomes high pressure and shocking loading which commonly cause pumping problems when using O-rings in flange sealing applications preventing reliable sealing.

The Hallite 657 is moulded in Hythane® 181, Hallite's high-performance polyurethane, for easy installation and excellent low temperature performance. The Hallite 657 is also offered in an industrial standard grade of polyurethane.

Also listed are two non-SAE seal sizes for metric flanges.



FEATURES

- SAE flange sizes
- Replaces an O-ring
- Manufactured in high specification material
- Also offered in industrial grade material option

MATERIALS

This product comes in a number of material options to extend operating conditions. Contact your local Hallite technical team to decide which is best for your application. Use the part designator in the table below as the last digit of the part number to specify material choice when ordering. For further material details, please refer to the Hallite Material Table.

MATERIAL OPTIONS	Name	Type	Color	Part Designator
Standard	Hythane® 181	TPU-EU	Blue	0
Optional	PU 021	TPU-AU	Dark Blue	1



TECHNICAL DETAILS

OPERATING CONDITIONS	METRIC	INCH
Maximum Speed	Static	Static
Temperature Range - Hythane® 181	-45°C +110°C	-50°F +230°F
Temperature Range - PU 021	-30°C +100°C	-22°F +212°F
Maximum Pressure	600 bar	8500 psi

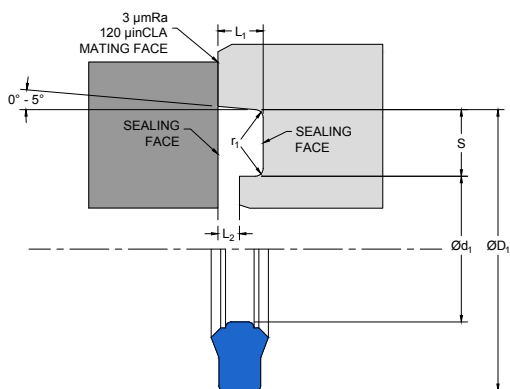
NOTE

Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.

SURFACE ROUGHNESS	µmRa	µmRz	µmRt	µinRa	µinRz	µinRt
Sealing Faces	0.8 max	3.2 max	6.3 max	32 max	64 max	128 max
Mating Face	3 max	10 - 15	20 - 30	120 max	400 - 600	800 - 1200

RADII	Metric	Inch
Max Fillet Rad r_1	0.80	0.030

TOLERANCES	ØD ₁	S	L ₁	L ₂
mm	±0.10	±0.25	±0.05	+0 -0.25
in	+0.005 -0	±0.015	+0.005 -0	+0 -0.010



657

ADDITIONAL PRODUCT

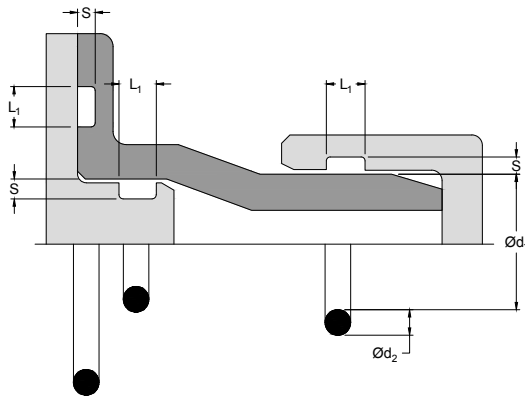
*Polyurethane Flange Seal for
SAE J518 Type Flanges*

PART NUMBER RANGE

INCH							
NOMINAL (SAE J518)	ØD ₁	TOL	Ød ₁	S ±0.010	L ₁ +0.005 -0	L ₂ +0-0.010	PART No.
½	1.000	+0.005 0.000	0.670	0.165	0.110	0.010	4490900
¾	1.250	+0.005 0.000	0.920	0.165	0.110	0.010	4491000
1	1.560	+0.005 0.000	1.230	0.165	0.110	0.010	4491100
1¼	1.750	+0.005 0.000	1.420	0.165	0.110	0.010	4422000
1½	2.125	+0.010 0.000	1.785	0.165	0.110	0.010	4422100
2	2.500	+0.010 0.000	2.160	0.165	0.110	0.010	4422200
METRIC							
ØD ₁ ±0.10	TOL	Ød ₁ ±0.25	S ±0.05	L ₁ +0-0.25	L ₂ No.	PART No.	
33.50	26.30	3.60	2.20	0.25	4432800	4490900	
45.00	36.20	4.40	3.30	0.25	4491200	4491000	



O-RINGS



DESIGN

O-rings are a simple but very versatile seal and are either used as sealing elements or as energizing elements for hydraulic slipper seals and wipers and cover a wide variety of applications in every field of industry including aerospace, fluid power, and general engineering.

While most commonly used for static sealing applications of inactive machinery, O-rings in dynamic applications are recommended only for moderate service conditions. For pressures over 1500 psi, they are commonly used with back-up rings.

A broad range of elastomer materials for both standard and special applications allow the O-Ring to be used to seal against liquid and gaseous media. NBR and FKM are suitable for use in mineral oil, water and air. FKM O-rings are also suitable for use in most aggressive fluids and in temperatures of up to 200°C (390°F).

Each Hallite office can advise you on the range of O-ring that we can supply in inch or metric to your home country. These include ranges to suit: ISO 3601-1, AS 568, AN 6227, AN6230, BS 4518, JIS B2401, and DIN 3370.

OPERATING CONDITIONS	METRIC	INCH
Temperature Range - NBR	-30°C +100°C	-22°F +212°F
Temperature Range - FKM	-20°C +200°C	-4°F +390°F

OTHER BACK-UP RINGS



TECHNICAL DETAILS

Back-up rings offer additional support to a sealing element, extending the performance and durability of the seal. Back-up components also provide protection against extrusion, allowing the applications to operate at higher pressures. Back-up rings are offered in many different configurations from full face to integrated designs. Designs are also available for static and dynamic applications. Depending on the application, Hallite offers a full range of materials to ensure maximum production of the sealing element. Hallite offers a full range of sizes that may be available in small quantities within 24 hours.

OPERATING CONDITIONS	METRIC	INCH
Temperature Range	-30 to 200°C	-22 to 392°F

NOTE

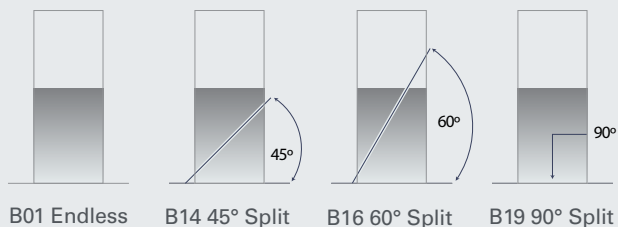
Data given are maximum values and can apply depending on specific application. Maximum ratings of temperature, pressure, or operating speeds are dependent on fluid medium, surface, gap value, and other variables such as dynamic or static service. Maximum values are not intended for use together at the same time, e.g. max temperature and max pressure. Please contact your Hallite technical representative for application support.



OTHER BACK-UP RING TYPES

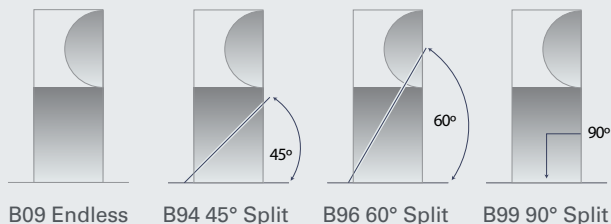
RECTANGULAR BACK-UP AND ANTI-DIESEL RINGS

This is the most common profile used for protecting an O-ring or rod seal from extrusion. This profile is offered in both endless and split profiles for ease of installation and maximum performance. Another common application is anti-contamination/anti-diesel rings. All profiles are available for both static and dynamic applications. Hallite offers many material options for various applications such as Armorlene® PTFE compounds, PEEK, POM, PA, Composites, TPU, TPE, PPS, NBR, HNBR, and FKM.



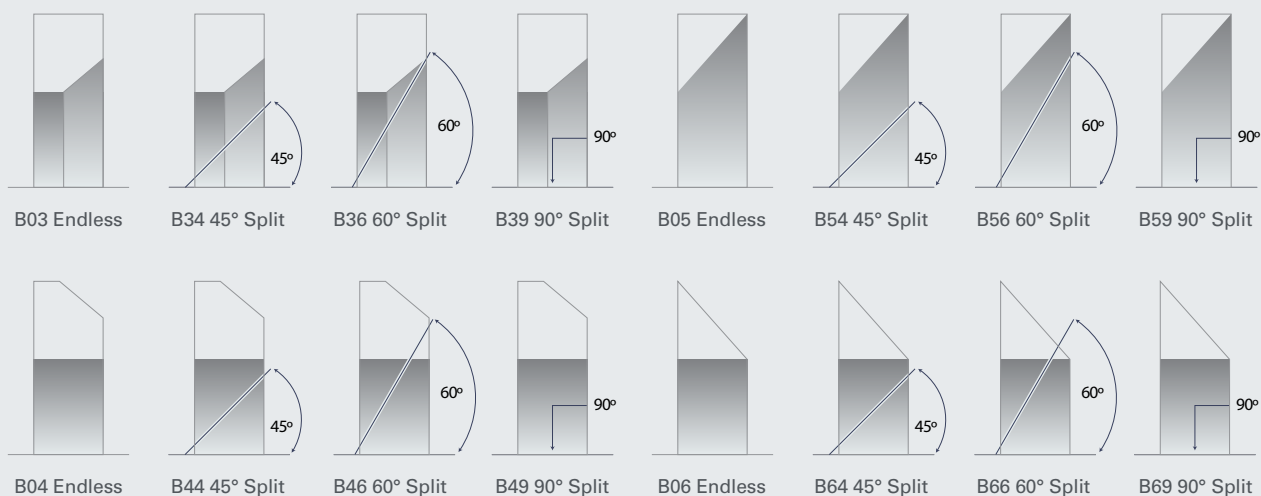
CONTOURED BACK-UP RINGS

The contoured back-up ring design is used with an O-ring to provide additional support and protection from extrusion. The concave feature of this back-up ring offers a pocket that keeps the O-ring centered on the back-up ring, assuring maximum protection in the application. This protection allows the O-ring to function at higher pressures without the occurrence of extrusion. Hallite offers many material options for various applications such as Armorlene® PTFE compounds, PEEK, POM, PA, Composites, TPU, TPE, PPS, NBR, HNBR, and FKM.



INTEGRATED BACK-UP RINGS

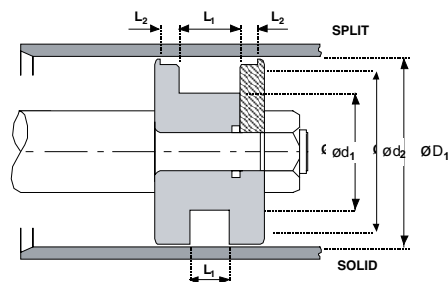
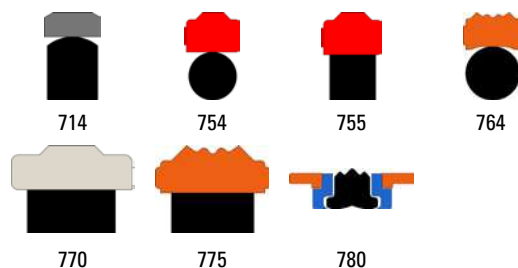
Integrated back-up rings are specially designed to be integrated into the sealing element in order to provide maximum extrusion protection. Hallite offers several different designs to maximize performance of the seal as well as many material options for various applications such as Armorlene® PTFE compounds, PEEK, POM, PA, Composites, TPU, TPE, PPS, NBR, HNBR, and FKM.



PRODUCT INDEX

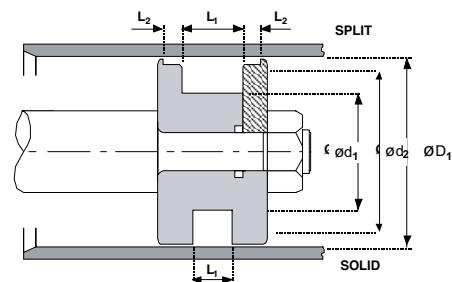
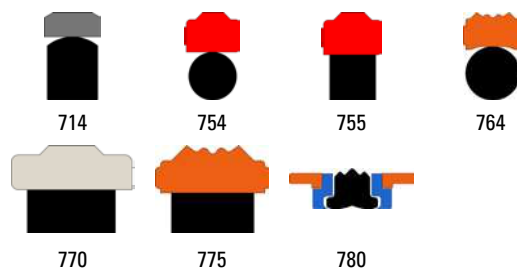
PRODUCT INDEX

DOUBLE-ACTING PISTON SEALS	270
SINGLE-ACTING PISTON SEALS	272
ROD SEALS	287
WIPERS	304



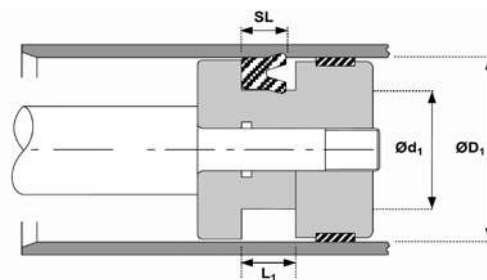
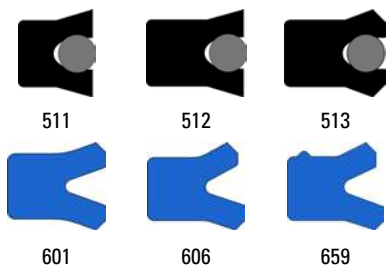
NOMINAL						
TYPE	ØD ₁	Ød ₁	Ød ₂	L ₁	L ₂	PART No.
770	0.750	0.508		0.187		4817712
770	0.875	0.633		0.187		4817812
755	1.000	0.691		0.129		8910000
770	1.000	0.758		0.187		4817912
770	1.125	0.883		0.187		4818012
764	1.250	0.817		0.165		4751210
755	1.250	0.941		0.129		8910100
754	1.250	0.974		0.126		4339810
770	1.250	1.008		0.187		4554412
764	1.375	0.942		0.165		4764110
754	1.375	1.079		0.126		4352410
770	1.375	1.133		0.187		4716912
775	1.375	1.133		0.187		4763516
754	1.500	1.067		0.165		4432310
764	1.500	1.067		0.165		4764210
755	1.500	1.191		0.129		8910200
754	1.500	1.204		0.125		4428710
770	1.500	1.258		0.187		4717012
775	1.500	1.258		0.187		4731816
775	1.500	1.258		0.275		4730516
770	1.625	1.383		0.187		4717112
714	1.750	1.212		0.282		7267610
780	1.750	1.380	1.640	0.490	0.240	5008510
755	1.750	1.441		0.129		8910300
770	1.750	1.508		0.187		4717212
775	1.750	1.508		0.187		4750716
780	2.000	1.375	1.820	0.750	0.250	5010910
764	2.000	1.390		0.248		4764810
714	2.000	1.462		0.282		7268210
755	2.000	1.462		0.283		4553520
754	2.000	1.567		0.165		4327110
755	2.000	1.606		0.129		8913100
780	2.000	1.625	1.888	0.490	0.240	5010010
770	2.000	1.630		0.281		4553512
775	2.000	1.630		0.281		4731016
775	2.000	1.630		0.410		4733716
755	2.000	1.691		0.129		8910400
764	2.125	1.515		0.248		4765410
770	2.125	1.755		0.281		4717312

NOMINAL						
TYPE	ØD ₁	Ød ₁	Ød ₂	L ₁	L ₂	PART No.
780	2.250	1.625	2.070	0.750	0.250	5011010
714	2.250	1.712		0.282		7267710
770	2.250	1.880		0.281		4717412
755	2.250	1.941		0.129		8910500
780	2.375	1.750	2.196	0.760	0.250	5001030
780	2.500	1.875	2.320	0.750	0.250	5011110
764	2.500	1.890		0.248		4766810
714	2.500	1.908		0.312		7261710
714	2.500	1.962		0.282		7260810
755	2.500	1.962		0.283		4490020
780	2.500	2.000	2.320	0.650	0.240	5010110
754	2.500	2.067		0.165		4326910
755	2.500	2.106		0.129		4439310
770	2.500	2.130		0.281		4490012
775	2.500	2.130		0.281		4731116
775	2.500	2.130		0.410		4726916
755	2.500	2.191		0.129		8910600
754	2.750	2.140		0.248		4763410
764	2.750	2.140		0.248		4759710
714	2.750	2.212		0.282		7267810
754	2.750	2.318		0.165		4326810
764	2.750	2.318		0.165		4741410
770	2.750	2.380		0.281		4817512
755	2.750	2.441		0.129		8910700
770	2.875	2.505		0.281		4817612
780	3.000	2.250	2.773	0.937	0.250	5011210
780	3.000	2.375	2.772	0.778	0.240	5010210
764	3.000	2.390		0.248		4767110
714	3.000	2.408		0.312		7261810
714	3.000	2.442		0.282		7260910
755	3.000	2.462		0.283		8910800
770	3.000	2.630		0.281		4349412
775	3.000	2.630		0.281		4731216
775	3.000	2.630		0.410		4733816
754	3.250	2.640		0.248		4428810
714	3.250	2.692		0.282		7262910
755	3.250	2.712		0.283		8910900
770	3.250	2.880		0.281		4349512
780	3.500	2.750	3.273	0.937	0.250	5011310



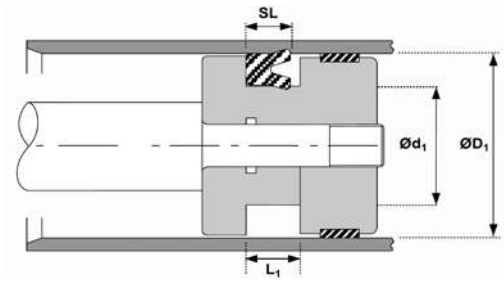
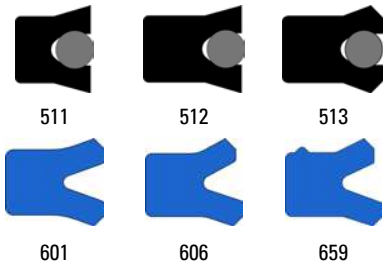
NOMINAL						
TYPE	ØD ₁	Ød ₁	Ød ₂	L ₁	L ₂	PART No.
780	3.500	2.852	3.272	0.778	0.290	5010310
714	3.500	2.908		0.312		7261910
714	3.500	2.942		0.282		7261110
755	3.500	2.962		0.283		8911000
770	3.500	3.130		0.281		4349612
775	3.500	3.130		0.281		4731316
775	3.500	3.130		0.410		4733916
714	3.750	3.192		0.282		7263110
755	3.750	3.212		0.283		8911100
770	3.750	3.380		0.281		4349712
780	4.000	3.250	3.772	0.937	0.250	5011410
780	4.000	3.376	3.772	0.778	0.240	5010410
754	4.000	3.390		0.248		4428910
714	4.000	3.408		0.312		7262110
714	4.000	3.442		0.282		7261210
755	4.000	3.462		0.283		8911200
770	4.000	3.630		0.281		4349812
775	4.000	3.630		0.281		4731416
775	4.000	3.630		0.410		4734016
714	4.250	3.692		0.282		7263210
755	4.250	3.712		0.283		8911300
770	4.250	3.880		0.281		4349912
780	4.500	3.500	4.231	1.250	0.250	5011510
780	4.500	3.876	4.272	0.778	0.240	5010510
714	4.500	3.908		0.312		7262210
714	4.500	3.942		0.282		7261310
755	4.500	3.962		0.283		8911400
770	4.500	4.130		0.281		4350012
714	4.750	4.192		0.282		7267910
755	4.750	4.212		0.283		8911500
770	4.750	4.380		0.281		4350112
780	5.000	4.000	4.711	1.250	0.375	5011610
714	5.000	4.240		0.375		7262310
780	5.000	4.252	4.772	0.958	0.240	5010610
754	5.000	4.390		0.248		4429010
714	5.000	4.442		0.282		7268310
755	5.000	4.462		0.283		8911600
775	5.000	4.528		0.538		4730616
770	5.000	4.630		0.281		4350212

NOMINAL						
TYPE	ØD ₁	Ød ₁	Ød ₂	L ₁	L ₂	PART No.
775	5.000	4.630			0.281	4731516
714	5.250	4.490			0.375	7268410
755	5.250	4.504			0.378	8911700
770	5.250	4.778			0.375	4350322
714	5.500	4.740			0.375	7261410
755	5.500	4.754			0.378	8911800
770	5.500	5.028			0.375	4350422
755	5.750	5.004			0.378	8913200
780	6.000	5.000	5.711	1.250	0.375	5011710
714	6.000	5.240			0.375	7261610
755	6.000	5.254			0.378	8911900
770	6.000	5.528			0.375	4350522
775	6.000	5.528			0.538	4734116
755	6.250	5.504			0.378	8912000
770	6.250	5.778			0.375	4350622
714	6.500	5.740			0.375	7262410
755	6.500	5.754			0.378	8912100
770	6.500	6.028			0.375	4350722
714	7.000	6.240			0.375	7262610
755	7.000	6.250			0.312	4394810
755	7.000	6.254			0.378	8912200
770	7.000	6.528			0.375	4350822
755	7.250	6.504			0.378	8912300
714	7.500	6.740			0.375	7262710
755	7.500	6.754			0.378	8912400
714	8.000	7.240			0.375	7262810
755	8.000	7.254			0.378	8912500
770	8.000	7.528			0.375	4351122
755	8.437	7.691			0.378	8913000
755	8.500	7.754			0.378	8912600
714	9.000	8.124			0.375	7268010
755	9.000	8.137			0.378	8912700
755	9.500	8.637			0.378	8912800
714	10.000	9.124			0.375	7268110
755	10.000	9.137			0.378	8912900



NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
511	0.313	0.063	0.125	0.138	8920810
511	0.375	0.125	0.125	0.138	8900810
513	0.375	0.125	0.250	0.275	8922910
511	0.438	0.188	0.125	0.138	8800110
513	0.438	0.188	0.250	0.275	8923010
511	0.500	0.250	0.125	0.138	8800210
513	0.500	0.250	0.125	0.138	8933610
513	0.500	0.250	0.188	0.207	8845910
512	0.500	0.250	0.250	0.275	8820210
513	0.500	0.250	0.250	0.275	8878510
513	0.563	0.188	0.188	0.207	8923110
511	0.563	0.313	0.125	0.138	8902810
513	0.563	0.313	0.125	0.138	8923310
513	0.563	0.313	0.250	0.275	8923510
513	0.625	0.250	0.188	0.207	8923210
511	0.625	0.375	0.125	0.138	8800410
513	0.625	0.375	0.125	0.138	8908610
513	0.625	0.375	0.188	0.207	8923610
513	0.625	0.375	0.250	0.275	8823810
513	0.688	0.313	0.188	0.207	8923410
511	0.688	0.438	0.125	0.138	8905110
513	0.688	0.438	0.125	0.138	8902510
513	0.688	0.438	0.250	0.275	8846910
513	0.750	0.375	0.156	0.172	8901410
511	0.750	0.375	0.188	0.207	8902910
606	0.750	0.375	0.313	0.344	4707100
511	0.750	0.500	0.125	0.138	8800610
513	0.750	0.500	0.125	0.138	8907910
512	0.750	0.500	0.250	0.275	8870510
513	0.750	0.500	0.250	0.275	8834010
601	0.750	0.500	0.250	0.275	4566500
511	0.813	0.313	0.250	0.275	8824710
511	0.813	0.563	0.125	0.138	8844610
513	0.813	0.563	0.125	0.138	8923710
511	0.875	0.250	0.312	0.344	8899710
511	0.875	0.375	0.250	0.275	8865810
511	0.875	0.500	0.188	0.207	8800710
601	0.875	0.500	0.197	0.218	4300000
513	0.875	0.500	0.250	0.275	8848010

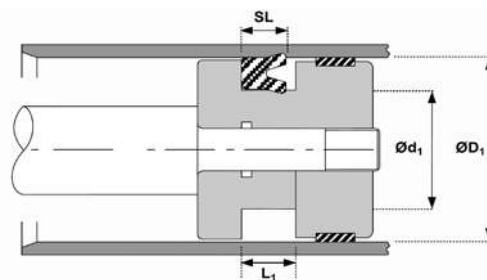
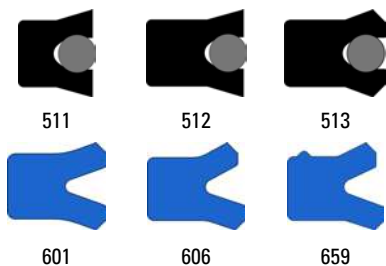
NOMINAL					
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513	0.875	0.500	0.313	0.344	8852910
511	0.875	0.625	0.125	0.138	8800810
513	0.875	0.625	0.125	0.138	8906210
513	0.875	0.625	0.188	0.207	8848710
512	0.875	0.625	0.250	0.275	8820510
513	0.875	0.625	0.250	0.275	8834110
513	0.938	0.438	0.375	0.413	8863110
511	0.938	0.563	0.188	0.207	8932810
511	0.938	0.688	0.125	0.138	8801010
511	1.000	0.375	0.313	0.344	8824910
511	1.000	0.500	0.250	0.275	8806310
601	1.000	0.500	0.250	0.275	4110201
512	1.000	0.500	0.375	0.413	8922310
513	1.000	0.500	0.375	0.413	8837710
511	1.000	0.625	0.188	0.207	8800910
513	1.000	0.625	0.188	0.207	8923810
601	1.000	0.625	0.190	0.218	4298300
513	1.000	0.625	0.313	0.344	8902710
511	1.000	0.750	0.125	0.138	8801110
513	1.000	0.750	0.125	0.138	8905310
512	1.000	0.750	0.250	0.275	8820710
513	1.000	0.750	0.250	0.275	8834210
511	1.063	0.813	0.125	0.138	8815310
513	1.063	0.813	0.125	0.138	8924110
513	1.063	0.813	0.250	0.275	8924210
511	1.125	0.625	0.250	0.275	8806410
601	1.125	0.625	0.250	0.275	4509101
513	1.125	0.625	0.313	0.344	8849210
513	1.125	0.625	0.375	0.413	8923910
511	1.125	0.750	0.188	0.207	8801210
513	1.125	0.750	0.188	0.207	8849810
513	1.125	0.750	0.250	0.275	8846010
512	1.125	0.750	0.313	0.344	8820810
513	1.125	0.750	0.313	0.344	8834310
606	1.125	0.750	0.313	0.344	4565600
513	1.125	0.750	0.375	0.413	8855810
511	1.125	0.875	0.125	0.138	8801410
513	1.125	0.875	0.125	0.138	8924310
513	1.125	0.875	0.250	0.275	8845310



SINGLE-ACTING PISTON SEALS - INCH

NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
512	1.188	0.688	0.375	0.413	8906110
511	1.188	0.938	0.125	0.138	8844810
513	1.188	0.938	0.125	0.138	8924610
513	1.188	0.938	0.250	0.275	8900910
511	1.250	0.750	0.250	0.275	8806510
513	1.250	0.750	0.250	0.275	8924010
601	1.250	0.750	0.250	0.275	4102901
512	1.250	0.750	0.375	0.413	8825010
513	1.250	0.750	0.375	0.413	8837810
511	1.250	0.875	0.188	0.207	8801510
513	1.250	0.875	0.188	0.207	8924410
606	1.250	0.875	0.250	0.275	4800300
513	1.250	0.875	0.313	0.344	8900210
512	1.250	0.875	0.375	0.413	8933110
511	1.250	1.000	0.125	0.138	8801610
513	1.250	1.000	0.125	0.138	8924810
659	1.250	1.000	0.171	0.187	4416600
513	1.250	1.000	0.188	0.207	8860110
512	1.250	1.000	0.250	0.275	8821210
513	1.250	1.000	0.250	0.275	8834410
511	1.313	0.688	0.312	0.344	8906710
513	1.313	0.938	0.313	0.344	8924710
511	1.313	1.000	0.156	0.172	8810110
513	1.313	1.000	0.156	0.172	8925010
511	1.313	1.063	0.125	0.138	8801810
513	1.313	1.063	0.125	0.138	8925210
513	1.313	1.063	0.250	0.275	8845710
511	1.375	0.875	0.250	0.275	8806610
513	1.375	0.875	0.250	0.275	8924510
601	1.375	0.875	0.250	0.275	4507101
512	1.375	0.875	0.313	0.344	8906810
513	1.375	0.875	0.313	0.344	8830210
513	1.375	0.875	0.375	0.413	8864610
511	1.375	1.000	0.188	0.207	8801710
513	1.375	1.000	0.188	0.207	8806110
513	1.375	1.000	0.250	0.275	8860510
513	1.375	1.000	0.281	0.310	8925110
512	1.375	1.000	0.313	0.344	8821310
513	1.375	1.000	0.313	0.344	8834510

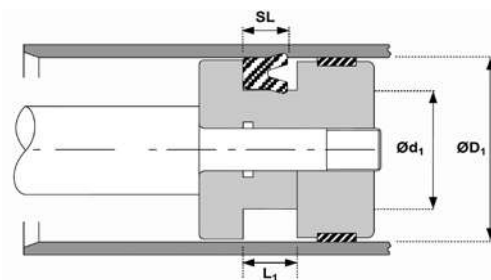
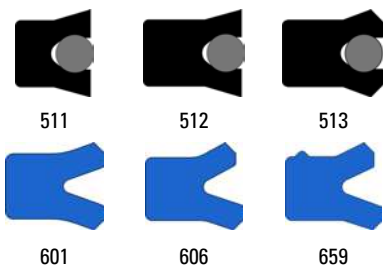
NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
511	1.375	1.125	0.125	0.138	8801910
513	1.375	1.125	0.125	0.138	8899910
513	1.375	1.125	0.188	0.207	8855510
512	1.375	1.125	0.250	0.275	8854910
513	1.375	1.125	0.250	0.275	8855610
513	1.375	1.125	0.313	0.344	8848810
511	1.438	0.938	0.250	0.275	8921010
513	1.438	1.063	0.313	0.344	8850010
511	1.438	1.188	0.125	0.138	8921310
512	1.438	1.188	0.188	0.207	8858010
513	1.438	1.188	0.250	0.275	8848910
511	1.500	0.875	0.313	0.344	8920910
511	1.500	1.000	0.250	0.275	8806810
513	1.500	1.000	0.250	0.275	8924910
601	1.500	1.000	0.250	0.275	4111101
512	1.500	1.000	0.313	0.344	8906910
512	1.500	1.000	0.375	0.413	8825210
513	1.500	1.000	0.375	0.413	8837910
512	1.500	1.000	0.437	0.480	8907210
511	1.500	1.125	0.188	0.207	8802010
513	1.500	1.125	0.188	0.207	8907710
512	1.500	1.125	0.250	0.275	8820610
513	1.500	1.125	0.250	0.275	8844910
606	1.500	1.125	0.250	0.275	4426700
512	1.500	1.125	0.313	0.344	8821710
513	1.500	1.125	0.313	0.344	8834610
511	1.500	1.187	0.156	0.172	8811010
511	1.500	1.250	0.125	0.138	8802210
513	1.500	1.250	0.125	0.138	8925510
513	1.500	1.250	0.188	0.207	8860210
659	1.500	1.250	0.187	0.207	4372400
512	1.500	1.250	0.250	0.275	8821810
513	1.500	1.250	0.250	0.275	8834710
606	1.500	1.250	0.250	0.275	4426800
511	1.563	1.188	0.188	0.207	8851710
513	1.563	1.188	0.188	0.207	8925410
513	1.563	1.188	0.313	0.344	8902310
511	1.563	1.250	0.156	0.172	8813810
513	1.563	1.313	0.125	0.138	8926010



NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
511	1.625	0.875	0.375	0.413	8933210
511	1.625	1.000	0.313	0.344	8806910
513	1.625	1.000	0.375	0.413	8828310
512	1.625	1.000	0.500	0.550	8825310
513	1.625	1.000	0.500	0.550	8838010
511	1.625	1.125	0.250	0.275	8807010
513	1.625	1.125	0.250	0.275	8804910
512	1.625	1.125	0.375	0.413	8847610
513	1.625	1.125	0.375	0.413	8856110
511	1.625	1.250	0.188	0.207	8802310
513	1.625	1.250	0.188	0.207	8925610
513	1.625	1.250	0.250	0.275	8860610
512	1.625	1.250	0.313	0.344	8821910
513	1.625	1.250	0.313	0.344	8834810
513	1.625	1.250	0.375	0.413	8860710
511	1.625	1.375	0.125	0.138	8802410
513	1.625	1.375	0.125	0.138	8926210
513	1.625	1.375	0.188	0.207	8860310
512	1.625	1.375	0.250	0.275	8822110
513	1.625	1.375	0.250	0.275	8834910
511	1.688	1.188	0.250	0.275	8921210
513	1.688	1.313	0.313	0.344	8925910
511	1.688	1.375	0.156	0.172	8813910
513	1.688	1.375	0.156	0.172	8926410
513	1.688	1.438	0.125	0.138	8926510
513	1.688	1.438	0.250	0.275	8849010
511	1.750	1.000	0.375	0.413	8819110
511	1.750	1.125	0.313	0.344	8807110
513	1.750	1.125	0.313	0.344	8925310
513	1.750	1.125	0.500	0.550	8879810
511	1.750	1.250	0.250	0.275	8807210
513	1.750	1.250	0.250	0.275	8925710
601	1.750	1.250	0.250	0.275	4502701
512	1.750	1.250	0.375	0.413	8825410
513	1.750	1.250	0.375	0.413	8838110
601	1.750	1.250	0.375	0.413	4107001
659	1.750	1.250	0.375	0.413	4528600
511	1.750	1.375	0.188	0.207	8802510
513	1.750	1.375	0.188	0.207	8926110

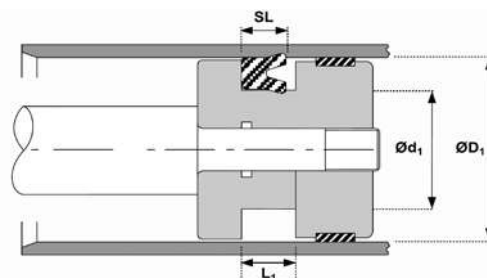
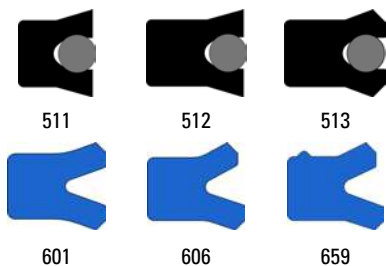
NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
513	1.750	1.375	0.250	0.275	8844710
512	1.750	1.375	0.313	0.344	8822210
513	1.750	1.375	0.313	0.344	8835010
512	1.750	1.375	0.375	0.413	8870710
513	1.750	1.375	0.375	0.413	8835110
601	1.750	1.375	0.375	0.413	4353400
511	1.750	1.500	0.125	0.138	8802610
513	1.750	1.500	0.125	0.138	8926610
512	1.750	1.500	0.250	0.275	8822310
513	1.750	1.500	0.250	0.275	8835210
606	1.750	1.500	0.250	0.275	4769800
511	1.813	1.188	0.313	0.344	8933010
513	1.813	1.313	0.375	0.413	8902610
511	1.875	1.125	0.375	0.413	8921110
511	1.875	1.250	0.313	0.344	8870010
513	1.875	1.250	0.313	0.344	8809810
513	1.875	1.250	0.500	0.550	8838210
511	1.875	1.375	0.250	0.275	8807310
513	1.875	1.375	0.250	0.275	8926310
512	1.875	1.375	0.375	0.413	8825610
513	1.875	1.375	0.375	0.413	8878610
511	1.875	1.500	0.188	0.207	8802710
513	1.875	1.500	0.188	0.207	8851510
513	1.875	1.500	0.250	0.275	8835310
513	1.875	1.500	0.313	0.344	8849710
512	1.875	1.500	0.375	0.413	8822510
513	1.875	1.500	0.375	0.413	8835410
513	1.875	1.500	0.406	0.447	8848110
511	1.875	1.625	0.125	0.138	8802810
513	1.875	1.625	0.125	0.138	8926910
513	1.875	1.625	0.188	0.207	8849110
512	1.875	1.625	0.250	0.275	8870610
513	1.875	1.625	0.250	0.275	8873110
511	2.000	1.250	0.375	0.413	8814310
513	2.000	1.250	0.375	0.413	8925810
513	2.000	1.250	0.500	0.550	8842010
601	2.000	1.375	0.266	0.312	4236201
511	2.000	1.375	0.313	0.344	8807410
513	2.000	1.375	0.313	0.344	8825110





NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
512	2.000	1.375	0.500	0.550	8871610
513	2.000	1.375	0.500	0.550	8873510
606	2.000	1.375	0.500	0.550	4364200
511	2.000	1.500	0.203	0.223	8801310
511	2.000	1.500	0.250	0.275	8807510
513	2.000	1.500	0.250	0.275	8908410
601	2.000	1.500	0.250	0.275	4111001
512	2.000	1.500	0.313	0.344	8821010
513	2.000	1.500	0.313	0.344	8867710
512	2.000	1.500	0.375	0.413	8825710
513	2.000	1.500	0.375	0.413	8838310
606	2.000	1.500	0.375	0.413	4376000
511	2.000	1.625	0.188	0.207	8802910
513	2.000	1.625	0.188	0.207	8926810
606	2.000	1.625	0.187	0.207	4426900
512	2.000	1.625	0.250	0.275	8908210
513	2.000	1.625	0.250	0.275	8868410
512	2.000	1.625	0.313	0.344	8858110
513	2.000	1.625	0.313	0.344	8864210
606	2.000	1.625	0.312	0.344	4444300
512	2.000	1.625	0.375	0.413	8822710
513	2.000	1.625	0.375	0.413	8835510
606	2.000	1.625	0.375	0.413	4364400
659	2.000	1.630	0.250	0.281	4563300
511	2.000	1.750	0.125	0.138	8803010
513	2.000	1.750	0.125	0.138	8927210
512	2.000	1.750	0.250	0.275	8822810
513	2.000	1.750	0.250	0.275	8835610
511	2.125	1.375	0.375	0.413	8814410
513	2.125	1.375	0.625	0.688	8933510
511	2.125	1.500	0.313	0.344	8807610
513	2.125	1.500	0.313	0.344	8926710
513	2.125	1.500	0.375	0.413	8846510
512	2.125	1.500	0.500	0.550	8825810
513	2.125	1.500	0.500	0.550	8838410
511	2.125	1.625	0.250	0.275	8807710
513	2.125	1.625	0.375	0.413	8849610
511	2.125	1.750	0.188	0.207	8803110
513	2.125	1.750	0.188	0.207	8927010

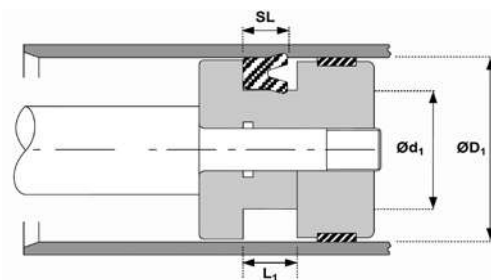
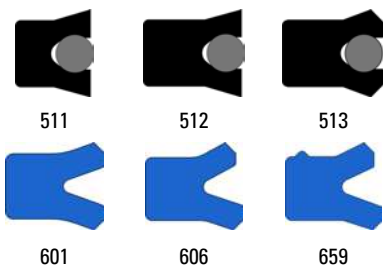
NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
513	2.125	1.750	0.230	0.250	8852010
513	2.125	1.750	0.250	0.275	8927110
513	2.125	1.750	0.313	0.344	8865410
512	2.125	1.750	0.375	0.413	8822910
513	2.125	1.750	0.375	0.413	8835710
511	2.125	1.875	0.125	0.138	8803210
513	2.125	1.875	0.188	0.207	8845810
513	2.125	1.875	0.250	0.275	8845410
511	2.250	1.500	0.375	0.413	8814510
512	2.250	1.500	0.500	0.550	8872710
513	2.250	1.500	0.500	0.550	8874810
512	2.250	1.500	0.625	0.688	8872810
513	2.250	1.500	0.625	0.688	8842710
511	2.250	1.625	0.313	0.344	8850910
511	2.250	1.750	0.250	0.275	8807810
513	2.250	1.750	0.250	0.275	8805610
601	2.250	1.750	0.250	0.275	4502601
512	2.250	1.750	0.375	0.413	8825910
513	2.250	1.750	0.375	0.413	8838510
601	2.250	1.750	0.375	0.413	4140901
606	2.250	1.750	0.375	0.413	4476500
511	2.250	1.875	0.188	0.207	8803310
513	2.250	1.875	0.188	0.207	8927310
512	2.250	1.875	0.375	0.413	8870810
513	2.250	1.875	0.375	0.413	8835810
606	2.250	1.875	0.375	0.413	4479600
511	2.250	2.000	0.125	0.138	8803410
513	2.250	2.000	0.188	0.207	8860410
512	2.250	2.000	0.250	0.275	8823110
513	2.250	2.000	0.250	0.275	8873210
511	2.375	1.625	0.375	0.413	8814710
513	2.375	1.625	0.375	0.413	8901010
601	2.375	1.750	0.266	0.312	4236301
511	2.375	1.750	0.313	0.344	8807910
513	2.375	1.750	0.375	0.413	8868810
659	2.375	1.750	0.437	0.481	4528500
512	2.375	1.750	0.500	0.550	8826010
513	2.375	1.750	0.500	0.550	8873610
601	2.375	1.750	0.562	0.619	4250901



NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
511	2.375	1.875	0.250	0.275	8808010
513	2.375	1.875	0.375	0.413	8859410
511	2.375	2.000	0.188	0.207	8803510
513	2.375	2.000	0.188	0.207	8927410
513	2.375	2.000	0.230	0.250	8806210
513	2.375	2.000	0.250	0.275	8868110
601	2.375	2.000	0.250	0.275	4508301
513	2.375	2.000	0.266	0.292	8927710
513	2.375	2.000	0.313	0.344	8860810
601	2.375	2.000	0.312	0.344	4509201
512	2.375	2.000	0.375	0.413	8823210
513	2.375	2.000	0.375	0.413	8835910
513	2.375	2.125	0.250	0.275	8908910
511	2.500	1.500	0.500	0.550	8814610
512	2.500	1.500	0.750	0.825	8820310
606	2.500	1.625	0.500	0.550	4364500
511	2.500	1.750	0.375	0.413	8814810
512	2.500	1.750	0.500	0.550	8830010
513	2.500	1.750	0.500	0.550	8874910
513	2.500	1.750	0.625	0.688	8875010
511	2.500	1.875	0.313	0.344	8808110
512	2.500	1.875	0.500	0.550	8826110
513	2.500	1.875	0.500	0.550	8873710
606	2.500	1.875	0.500	0.550	4376100
511	2.500	2.000	0.250	0.275	8808210
513	2.500	2.000	0.250	0.275	8856010
606	2.500	2.000	0.250	0.275	4516500
512	2.500	2.000	0.375	0.413	8826210
513	2.500	2.000	0.375	0.413	8838610
601	2.500	2.000	0.375	0.413	4353500
606	2.500	2.000	0.375	0.413	4391900
511	2.500	2.125	0.188	0.207	8803710
513	2.500	2.125	0.188	0.207	8908110
512	2.500	2.125	0.250	0.275	8865510
513	2.500	2.125	0.250	0.275	8845010
601	2.500	2.125	0.250	0.275	4508201
606	2.500	2.125	0.250	0.275	4427000
606	2.500	2.125	0.312	0.344	4444400
512	2.500	2.125	0.375	0.413	8870910

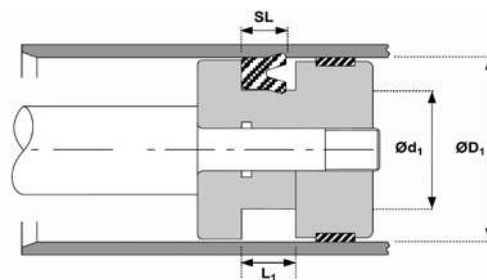
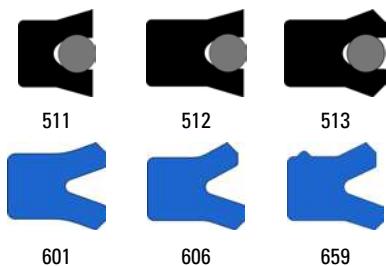
NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
513	2.500	2.125	0.375	0.413	8836010
606	2.500	2.125	0.375	0.413	4451300
659	2.500	2.130	0.250	0.281	4563400
511	2.500	2.250	0.125	0.138	8803810
513	2.500	2.250	0.250	0.275	8908810
512	2.563	2.188	0.375	0.413	8858210
511	2.625	2.000	0.313	0.344	8808310
512	2.625	2.000	0.500	0.550	8826310
513	2.625	2.000	0.500	0.550	8873810
601	2.625	2.000	0.500	0.550	4225101
513	2.625	2.000	0.563	0.619	8862210
601	2.625	2.000	0.562	0.619	4159801
511	2.625	2.125	0.250	0.275	8808410
513	2.625	2.125	0.250	0.275	8805810
512	2.625	2.125	0.375	0.413	8826410
513	2.625	2.125	0.375	0.413	8856310
601	2.625	2.125	0.375	0.413	4156101
511	2.625	2.250	0.188	0.207	8803910
513	2.625	2.250	0.188	0.207	8927910
512	2.625	2.250	0.313	0.344	8858310
513	2.625	2.250	0.313	0.344	8860910
512	2.625	2.250	0.375	0.413	8823410
513	2.625	2.250	0.375	0.413	8873310
511	2.625	2.375	0.125	0.138	8815610
513	2.750	1.750	0.750	0.825	8847010
511	2.750	2.000	0.375	0.413	8814910
513	2.750	2.000	0.375	0.413	8927610
512	2.750	2.000	0.500	0.550	8830310
513	2.750	2.000	0.500	0.550	8875110
512	2.750	2.000	0.625	0.688	8830410
513	2.750	2.000	0.625	0.688	8842810
511	2.750	2.125	0.313	0.344	8808510
513	2.750	2.125	0.313	0.344	8927810
513	2.750	2.125	0.500	0.550	8879910
513	2.750	2.125	0.625	0.688	8864810
511	2.750	2.250	0.250	0.275	8808610
512	2.750	2.250	0.375	0.413	8826510
513	2.750	2.250	0.375	0.413	8838710
601	2.750	2.250	0.375	0.413	4128701





TYPE	NOMINAL				PART No.
	ØD ₁	Ød ₁	SL	L ₁	
512	2.750	2.250	0.563	0.619	8864110
511	2.750	2.375	0.188	0.207	8804010
513	2.750	2.375	0.188	0.207	8928110
513	2.750	2.375	0.280	0.308	8903010
512	2.750	2.375	0.375	0.413	8858410
513	2.750	2.375	0.375	0.413	8861010
511	2.750	2.500	0.125	0.138	8800310
513	2.750	2.500	0.125	0.138	8928610
513	2.750	2.500	0.250	0.275	8902210
511	2.875	1.875	0.500	0.550	8825510
511	2.875	2.125	0.375	0.413	8815110
511	2.875	2.250	0.313	0.344	8808710
513	2.875	2.250	0.313	0.344	8816310
513	2.875	2.250	0.500	0.550	8838810
511	2.875	2.375	0.250	0.275	8808810
512	2.875	2.375	0.375	0.413	8826610
513	2.875	2.375	0.375	0.413	8850110
513	2.875	2.375	0.563	0.619	8900610
511	2.875	2.500	0.188	0.207	8804110
513	2.875	2.500	0.188	0.207	8928410
513	2.875	2.500	0.250	0.275	8908310
512	2.875	2.500	0.375	0.413	8871010
513	2.875	2.500	0.375	0.413	8836210
511	2.937	2.500	0.218	0.240	8921410
511	3.000	2.000	0.500	0.550	8815010
513	3.000	2.000	0.500	0.550	8927510
512	3.000	2.000	0.750	0.825	8853410
513	3.000	2.000	0.750	0.825	8876810
511	3.000	2.250	0.375	0.413	8869910
513	3.000	2.250	0.375	0.413	8928010
606	3.000	2.250	0.455	0.500	4375000
512	3.000	2.250	0.500	0.550	8872910
513	3.000	2.250	0.500	0.550	8875210
659	3.000	2.250	0.500	0.550	4528400
512	3.000	2.250	0.625	0.688	8873010
513	3.000	2.250	0.625	0.688	8842910
511	3.000	2.375	0.313	0.344	8808910
513	3.000	2.375	0.313	0.344	8827210
601	3.000	2.375	0.312	0.344	4107201

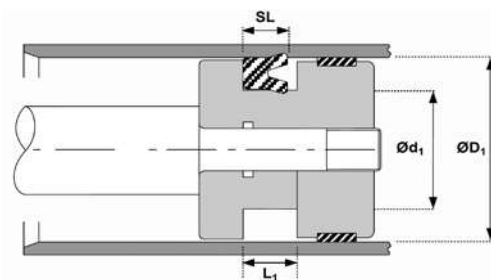
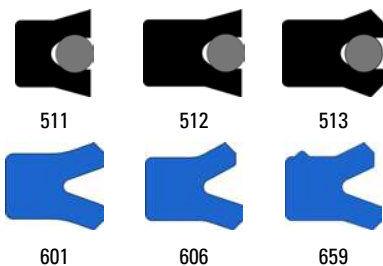
TYPE	NOMINAL				PART No.
	ØD ₁	Ød ₁	SL	L ₁	
512	3.000	2.375	0.500	0.550	8826710
513	3.000	2.375	0.500	0.550	8838910
606	3.000	2.375	0.500	0.550	4364600
511	3.000	2.500	0.203	0.223	8803610
511	3.000	2.500	0.250	0.275	8809010
513	3.000	2.500	0.250	0.275	8928310
606	3.000	2.500	0.250	0.275	4516600
512	3.000	2.500	0.313	0.344	8821110
513	3.000	2.500	0.313	0.344	8867810
512	3.000	2.500	0.375	0.413	8826810
513	3.000	2.500	0.375	0.413	8839010
601	3.000	2.500	0.375	0.413	4119501
606	3.000	2.500	0.375	0.413	4364700
511	3.000	2.563	0.218	0.240	8921510
659	3.000	2.618	0.375	0.413	4876000
511	3.000	2.625	0.188	0.207	8804210
513	3.000	2.625	0.188	0.207	8928710
606	3.000	2.625	0.187	0.207	4792800
513	3.000	2.625	0.250	0.275	8868510
512	3.000	2.625	0.313	0.344	8858510
513	3.000	2.625	0.313	0.344	8864310
512	3.000	2.625	0.375	0.413	8823710
513	3.000	2.625	0.375	0.413	8836310
606	3.000	2.625	0.375	0.413	4458400
659	3.000	2.630	0.250	0.281	4563500
511	3.000	2.750	0.125	0.138	8817910
511	3.125	2.125	0.500	0.550	8853110
513	3.125	2.375	0.625	0.688	8846810
511	3.125	2.500	0.313	0.344	8870110
601	3.125	2.500	0.312	0.344	4124401
513	3.125	2.500	0.375	0.413	8836110
512	3.125	2.500	0.500	0.550	8871810
513	3.125	2.500	0.500	0.550	8873910
511	3.125	2.625	0.250	0.275	8809110
513	3.125	2.625	0.375	0.413	8849310
601	3.125	2.625	0.375	0.413	4224701
511	3.125	2.750	0.188	0.207	8804410
513	3.125	2.750	0.188	0.207	8849910
513	3.125	2.750	0.313	0.344	8846110



NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
512	3.125	2.750	0.375	0.413	8871110
513	3.125	2.750	0.375	0.413	8836410
511	3.125	2.875	0.125	0.138	8814210
513	3.125	2.875	0.250	0.275	8847410
511	3.250	2.500	0.375	0.413	8815410
513	3.250	2.500	0.375	0.413	8928510
512	3.250	2.500	0.500	0.550	8879210
513	3.250	2.500	0.500	0.550	8875310
512	3.250	2.500	0.625	0.688	8830510
513	3.250	2.500	0.625	0.688	8843010
511	3.250	2.625	0.313	0.344	8851110
513	3.250	2.625	0.500	0.550	8933310
606	3.250	2.625	0.500	0.550	4376200
511	3.250	2.750	0.250	0.275	8809210
513	3.250	2.750	0.250	0.275	8805910
606	3.250	2.750	0.250	0.275	4516700
512	3.250	2.750	0.375	0.413	8826910
513	3.250	2.750	0.375	0.413	8839110
606	3.250	2.750	0.375	0.413	4474400
511	3.250	2.875	0.188	0.207	8851010
512	3.250	2.875	0.250	0.275	8865610
513	3.250	2.875	0.250	0.275	8861120
606	3.250	2.875	0.250	0.275	4427100
513	3.250	2.875	0.280	0.308	8903110
513	3.250	2.875	0.375	0.413	8861110
511	3.250	3.000	0.125	0.138	8804510
513	3.375	2.375	0.500	0.550	8928210
513	3.375	2.625	0.625	0.688	8863710
511	3.375	2.750	0.313	0.344	8809310
513	3.375	2.750	0.375	0.413	8868910
512	3.375	2.750	0.500	0.550	8871910
513	3.375	2.750	0.500	0.550	8839210
601	3.375	2.750	0.562	0.619	4250701
511	3.375	2.875	0.250	0.275	8809410
513	3.375	2.875	0.375	0.413	8830910
511	3.375	3.000	0.188	0.207	8804610
513	3.375	3.000	0.188	0.207	8806710
513	3.375	3.000	0.250	0.275	8868210
513	3.375	3.000	0.313	0.344	8861210

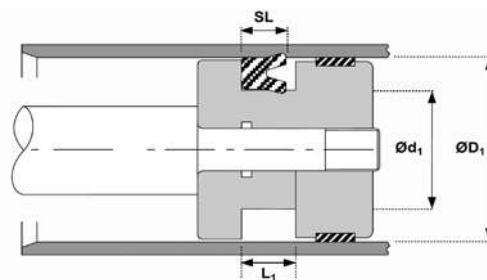
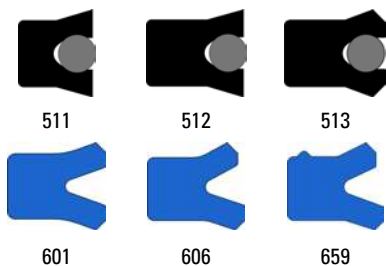
NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
512	3.375	3.000	0.375	0.413	8823910
513	3.375	3.000	0.375	0.413	8836510
511	3.500	2.500	0.500	0.550	8815510
513	3.500	2.500	0.750	0.825	8847110
511	3.500	2.750	0.375	0.413	8815710
512	3.500	2.750	0.500	0.550	8830710
513	3.500	2.750	0.500	0.550	8875410
606	3.500	2.750	0.500	0.550	4444600
512	3.500	2.750	0.625	0.688	8830810
513	3.500	2.750	0.625	0.688	8843110
606	3.500	2.750	0.625	0.688	4376300
511	3.500	2.875	0.313	0.344	8809510
606	3.500	2.875	0.312	0.344	4571100
601	3.500	2.875	0.325	0.360	4129701
512	3.500	2.875	0.500	0.550	8872010
513	3.500	2.875	0.500	0.550	8874010
606	3.500	2.875	0.500	0.550	4364800
511	3.500	3.000	0.203	0.223	8816110
511	3.500	3.000	0.250	0.275	8809610
513	3.500	3.000	0.250	0.275	8928810
606	3.500	3.000	0.250	0.275	4516800
512	3.500	3.000	0.375	0.413	8827010
513	3.500	3.000	0.375	0.413	8839310
601	3.500	3.000	0.375	0.413	4866200
606	3.500	3.000	0.375	0.413	4364900
513	3.500	3.000	0.500	0.550	8842110
512	3.500	3.000	0.563	0.619	8850610
513	3.500	3.000	0.563	0.619	8852210
511	3.500	3.125	0.188	0.207	8804710
513	3.500	3.125	0.188	0.207	8908710
512	3.500	3.125	0.250	0.275	8867310
513	3.500	3.125	0.250	0.275	8845110
606	3.500	3.125	0.275	0.302	4572200
512	3.500	3.125	0.375	0.413	8871210
513	3.500	3.125	0.375	0.413	8836610
606	3.500	3.125	0.375	0.413	4444500
659	3.500	3.130	0.250	0.281	4563600
511	3.500	3.250	0.125	0.138	8819610
512	3.563	3.188	0.375	0.413	8858610





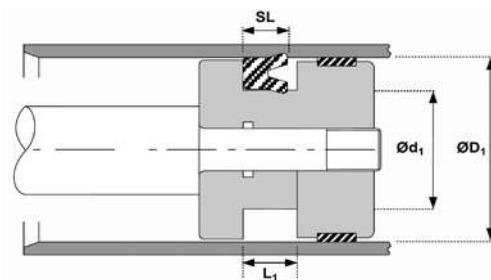
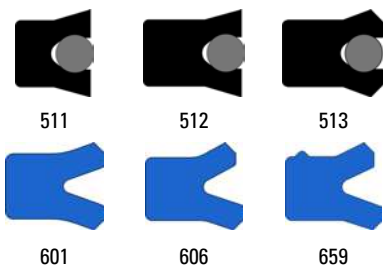
NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
659	3.625	2.875	0.562	0.619	4528300
511	3.625	3.000	0.313	0.344	8809710
513	3.625	3.000	0.313	0.344	8929010
513	3.625	3.000	0.375	0.413	8828510
512	3.625	3.000	0.500	0.550	8827110
513	3.625	3.000	0.500	0.550	8874110
601	3.625	3.000	0.562	0.619	4160001
513	3.625	3.125	0.250	0.275	8848510
512	3.625	3.125	0.375	0.413	8859510
513	3.625	3.125	0.375	0.413	8856210
511	3.625	3.250	0.188	0.207	8804810
512	3.625	3.250	0.313	0.344	8858710
513	3.625	3.250	0.313	0.344	8861310
512	3.625	3.250	0.375	0.413	8824010
513	3.625	3.250	0.375	0.413	8873410
511	3.750	2.750	0.500	0.550	8900010
511	3.750	3.000	0.375	0.413	8815910
513	3.750	3.000	0.375	0.413	8928910
512	3.750	3.000	0.500	0.550	8831010
513	3.750	3.000	0.500	0.550	8875510
512	3.750	3.000	0.625	0.688	8878710
513	3.750	3.000	0.625	0.688	8843210
511	3.750	3.125	0.313	0.344	8809910
513	3.750	3.125	0.313	0.344	8929210
513	3.750	3.125	0.500	0.550	8869810
511	3.750	3.250	0.250	0.275	8810010
512	3.750	3.250	0.375	0.413	8827310
513	3.750	3.250	0.375	0.413	8839410
606	3.750	3.250	0.375	0.413	4444700
511	3.750	3.375	0.188	0.207	8854210
513	3.750	3.375	0.188	0.207	8932910
513	3.750	3.375	0.250	0.275	8836720
513	3.750	3.375	0.280	0.308	8903210
512	3.750	3.375	0.375	0.413	8858810
513	3.750	3.375	0.375	0.413	8836710
511	3.750	3.500	0.125	0.138	8815810
513	3.875	3.125	0.375	0.413	8929110
513	3.875	3.125	0.625	0.688	8900310
511	3.875	3.250	0.313	0.344	8879610

NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
513	3.875	3.250	0.313	0.344	8820110
513	3.875	3.250	0.500	0.550	8869710
511	3.875	3.375	0.250	0.275	8850710
513	3.875	3.375	0.250	0.275	8929310
513	3.875	3.375	0.375	0.413	8849410
513	3.875	3.375	0.563	0.619	8900710
511	3.875	3.500	0.188	0.207	8805010
513	3.875	3.500	0.188	0.207	8929510
512	3.875	3.500	0.375	0.413	8824110
513	3.875	3.500	0.375	0.413	8836810
511	4.000	2.750	0.625	0.688	8819310
511	4.000	3.000	0.500	0.550	8816010
512	4.000	3.000	0.750	0.825	8850510
513	4.000	3.000	0.750	0.825	8863310
511	4.000	3.250	0.375	0.413	8816210
606	4.000	3.250	0.375	0.413	4517400
512	4.000	3.250	0.500	0.550	8831110
513	4.000	3.250	0.500	0.550	8875610
606	4.000	3.250	0.500	0.550	4444900
512	4.000	3.250	0.625	0.688	8831210
513	4.000	3.250	0.625	0.688	8843310
606	4.000	3.250	0.625	0.688	4376400
511	4.000	3.375	0.313	0.344	8810210
513	4.000	3.375	0.313	0.344	8827410
512	4.000	3.375	0.500	0.550	8872110
513	4.000	3.375	0.500	0.550	8874210
606	4.000	3.375	0.500	0.550	4365000
511	4.000	3.500	0.203	0.223	8817210
511	4.000	3.500	0.250	0.275	8810310
513	4.000	3.500	0.250	0.275	8929410
606	4.000	3.500	0.250	0.275	4516900
512	4.000	3.500	0.313	0.344	8865710
513	4.000	3.500	0.313	0.344	8867910
606	4.000	3.500	0.312	0.344	4427200
512	4.000	3.500	0.375	0.413	8827510
513	4.000	3.500	0.375	0.413	8839510
606	4.000	3.500	0.375	0.413	4365100
511	4.000	3.625	0.188	0.207	8805110
513	4.000	3.625	0.188	0.207	8929710



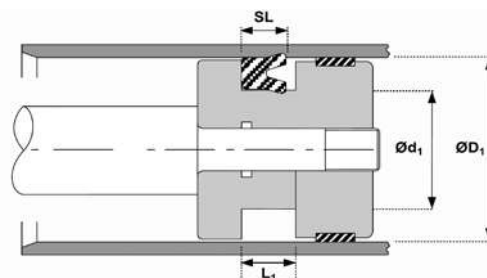
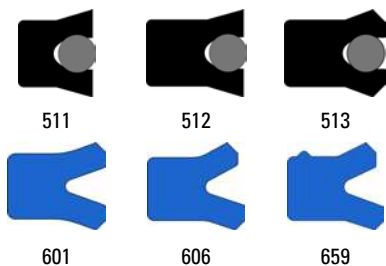
NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
513	4.000	3.625	0.250	0.275	8868610
512	4.000	3.625	0.313	0.344	8864010
513	4.000	3.625	0.313	0.344	8864410
512	4.000	3.625	0.375	0.413	8824210
513	4.000	3.625	0.375	0.413	8836910
606	4.000	3.625	0.375	0.413	4444800
659	4.000	3.630	0.250	0.281	4563700
511	4.000	3.750	0.125	0.138	8818710
511	4.125	3.375	0.375	0.413	8857710
512	4.125	3.375	0.625	0.688	8855910
513	4.125	3.375	0.625	0.688	8852110
511	4.125	3.500	0.313	0.344	8810410
513	4.125	3.500	0.375	0.413	8837410
512	4.125	3.500	0.500	0.550	8827710
513	4.125	3.500	0.500	0.550	8874310
511	4.125	3.625	0.250	0.275	8810510
513	4.125	3.625	0.375	0.413	8849510
511	4.125	3.750	0.188	0.207	8879410
513	4.125	3.750	0.188	0.207	8850210
513	4.125	3.750	0.313	0.344	8846210
512	4.125	3.750	0.375	0.413	8855010
513	4.125	3.750	0.375	0.413	8837010
511	4.125	3.875	0.125	0.138	8816510
513	4.125	3.875	0.250	0.275	8845510
511	4.175	3.550	0.250	0.275	8899510
511	4.250	3.500	0.375	0.413	8816410
512	4.250	3.500	0.500	0.550	8878810
513	4.250	3.500	0.500	0.550	8875710
659	4.250	3.500	0.562	0.619	4528200
512	4.250	3.500	0.625	0.688	8831310
513	4.250	3.500	0.625	0.688	8843410
511	4.250	3.625	0.313	0.344	8851210
513	4.250	3.625	0.375	0.413	8933910
511	4.250	3.750	0.250	0.275	8810610
513	4.250	3.750	0.250	0.275	8848610
512	4.250	3.750	0.375	0.413	8827810
513	4.250	3.750	0.375	0.413	8839710
606	4.250	3.750	0.375	0.413	4445000
513	4.250	3.750	0.563	0.619	8839810

NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
511	4.250	3.875	0.188	0.207	8823510
512	4.250	3.875	0.250	0.275	8820910
513	4.250	3.875	0.250	0.275	8861420
513	4.250	3.875	0.280	0.308	8903310
513	4.250	3.875	0.375	0.413	8861410
511	4.250	4.000	0.125	0.138	8805210
513	4.250	4.000	0.125	0.138	8930010
511	4.375	3.375	0.500	0.550	8866910
511	4.375	3.625	0.375	0.413	8824610
513	4.375	3.625	0.625	0.688	8865310
511	4.375	3.750	0.313	0.344	8870210
513	4.375	3.750	0.375	0.413	8869010
512	4.375	3.750	0.500	0.550	8872210
513	4.375	3.750	0.500	0.550	8874410
511	4.375	3.875	0.250	0.275	8810710
513	4.375	3.875	0.375	0.413	8832510
511	4.375	4.000	0.188	0.207	8805310
513	4.375	4.000	0.188	0.207	8820010
513	4.375	4.000	0.250	0.275	8868310
513	4.375	4.000	0.313	0.344	8861510
512	4.375	4.000	0.375	0.413	8824310
513	4.375	4.000	0.375	0.413	8837110
511	4.500	3.250	0.625	0.688	8822410
512	4.500	3.500	0.625	0.688	8907810
512	4.500	3.500	0.750	0.825	8823010
511	4.500	3.750	0.375	0.413	8816610
513	4.500	3.750	0.375	0.413	8929810
601	4.500	3.750	0.375	0.413	4119201
512	4.500	3.750	0.500	0.550	8831410
513	4.500	3.750	0.500	0.550	8875810
513	4.500	3.750	0.625	0.688	8875910
606	4.500	3.750	0.625	0.688	4371000
511	4.500	3.875	0.313	0.344	8870310
512	4.500	3.875	0.500	0.550	8872310
513	4.500	3.875	0.500	0.550	8839910
511	4.500	4.000	0.250	0.275	8810810
513	4.500	4.000	0.250	0.275	8929910
512	4.500	4.000	0.375	0.413	8827910
513	4.500	4.000	0.375	0.413	8840010



NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
606	4.500	4.000	0.375	0.413	4448100
513	4.500	4.000	0.500	0.550	8867510
601	4.500	4.000	0.511	0.562	4373400
512	4.500	4.000	0.563	0.619	8828010
513	4.500	4.000	0.563	0.619	8840110
511	4.500	4.125	0.188	0.207	8805410
513	4.500	4.125	0.250	0.275	8845210
512	4.500	4.125	0.313	0.344	8867210
512	4.500	4.125	0.375	0.413	8871310
513	4.500	4.125	0.375	0.413	8837210
511	4.500	4.250	0.125	0.138	8819710
512	4.563	4.188	0.375	0.413	8859010
511	4.625	3.875	0.375	0.413	8819210
511	4.625	4.000	0.313	0.344	8810910
513	4.625	4.000	0.500	0.550	8874510
513	4.625	4.000	0.563	0.619	8862310
513	4.625	4.125	0.250	0.275	8806010
512	4.625	4.125	0.375	0.413	8859610
513	4.625	4.125	0.375	0.413	8856410
511	4.625	4.250	0.188	0.207	8805510
512	4.625	4.250	0.313	0.344	8859110
513	4.625	4.250	0.313	0.344	8861610
512	4.625	4.250	0.375	0.413	8824410
513	4.625	4.250	0.375	0.413	8837310
511	4.750	4.000	0.375	0.413	8816810
601	4.750	4.000	0.375	0.413	4120501
512	4.750	4.000	0.500	0.550	8878910
513	4.750	4.000	0.500	0.550	8876010
601	4.750	4.000	0.536	0.600	4422500
512	4.750	4.000	0.625	0.688	8831610
513	4.750	4.000	0.625	0.688	8843510
511	4.750	4.125	0.313	0.344	8811110
513	4.750	4.125	0.500	0.550	8869610
513	4.750	4.125	0.625	0.688	8869510
511	4.750	4.250	0.250	0.275	8811210
513	4.750	4.250	0.250	0.275	8930310
512	4.750	4.250	0.375	0.413	8828210
513	4.750	4.250	0.375	0.413	8840210
512	4.750	4.250	0.563	0.619	8833710

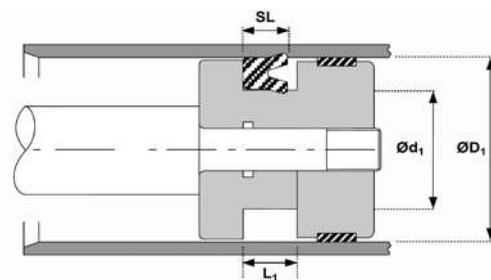
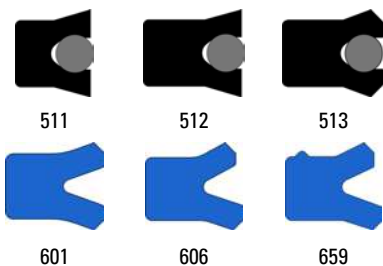
NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
513	4.750	4.250	0.563	0.619	8905810
511	4.750	4.375	0.188	0.207	8854310
513	4.750	4.375	0.280	0.308	8903410
512	4.750	4.375	0.375	0.413	8859210
513	4.750	4.375	0.375	0.413	8861710
606	4.750	4.379	0.275	0.302	4493600
511	4.875	4.125	0.375	0.413	8853210
511	4.875	4.250	0.313	0.344	8811310
513	4.875	4.250	0.313	0.344	8821610
513	4.875	4.250	0.500	0.550	8869410
513	4.875	4.250	0.563	0.619	8930210
511	4.875	4.375	0.250	0.275	8811410
513	4.875	4.375	0.250	0.275	8848310
513	4.875	4.375	0.563	0.619	8900510
511	4.875	4.500	0.188	0.207	8805710
512	4.875	4.500	0.375	0.413	8824510
513	4.875	4.500	0.375	0.413	8837510
513	5.000	3.500	0.750	0.825	8929610
511	5.000	4.000	0.500	0.550	8816910
513	5.000	4.000	0.500	0.550	8930110
659	5.000	4.000	0.731	0.804	4528100
512	5.000	4.000	0.750	0.825	8853510
513	5.000	4.000	0.750	0.825	8877410
511	5.000	4.250	0.375	0.413	8817010
513	5.000	4.250	0.375	0.413	8867410
606	5.000	4.250	0.375	0.413	4517500
512	5.000	4.250	0.500	0.550	8831810
513	5.000	4.250	0.500	0.550	8876110
606	5.000	4.250	0.500	0.550	4445100
512	5.000	4.250	0.625	0.688	8831910
513	5.000	4.250	0.625	0.688	8843610
606	5.000	4.250	0.625	0.688	4371100
511	5.000	4.375	0.313	0.344	8811510
513	5.000	4.375	0.313	0.344	8827610
512	5.000	4.375	0.500	0.550	8828410
513	5.000	4.375	0.500	0.550	8874610
512	5.000	4.375	0.563	0.619	8922410
512	5.000	4.375	0.625	0.688	8872410
513	5.000	4.375	0.625	0.688	8840410



NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
511	5.000	4.500	0.203	0.223	8804310
511	5.000	4.500	0.250	0.275	8811610
513	5.000	4.500	0.250	0.275	8817110
606	5.000	4.500	0.250	0.275	4517000
512	5.000	4.500	0.313	0.344	8821410
513	5.000	4.500	0.313	0.344	8868010
512	5.000	4.500	0.375	0.413	8828610
513	5.000	4.500	0.375	0.413	8840510
601	5.000	4.500	0.375	0.413	4129801
606	5.000	4.500	0.375	0.413	4365200
513	5.000	4.500	0.500	0.550	8864710
512	5.000	4.500	0.563	0.619	8828710
513	5.000	4.500	0.563	0.619	8840610
606	5.000	4.500	0.562	0.619	4495900
511	5.000	4.625	0.188	0.207	8879510
513	5.000	4.625	0.250	0.275	8868710
512	5.000	4.625	0.313	0.344	8859310
513	5.000	4.625	0.313	0.344	8864510
512	5.000	4.625	0.375	0.413	8855410
513	5.000	4.625	0.375	0.413	8837610
511	5.000	4.750	0.125	0.138	8818110
511	5.125	4.500	0.313	0.344	8811710
513	5.125	4.500	0.375	0.413	8840710
512	5.125	4.500	0.625	0.688	8872510
513	5.125	4.500	0.625	0.688	8840810
511	5.125	4.625	0.250	0.275	8811810
513	5.125	4.625	0.250	0.275	8848410
513	5.125	4.750	0.375	0.413	8846610
511	5.125	4.875	0.125	0.138	8816710
513	5.125	4.875	0.250	0.275	8845610
511	5.250	4.250	0.500	0.550	8858910
513	5.250	4.250	0.750	0.825	8847210
511	5.250	4.500	0.375	0.413	8817310
513	5.250	4.500	0.375	0.413	8930410
512	5.250	4.500	0.500	0.550	8832010
513	5.250	4.500	0.500	0.550	8876210
606	5.250	4.500	0.500	0.550	4445200
512	5.250	4.500	0.625	0.688	8832110
513	5.250	4.500	0.625	0.688	8843710

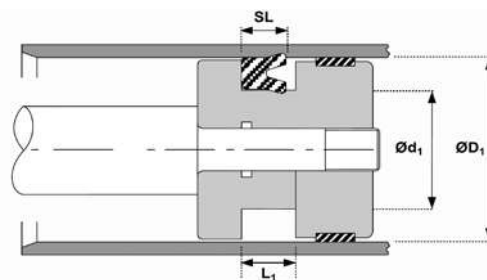
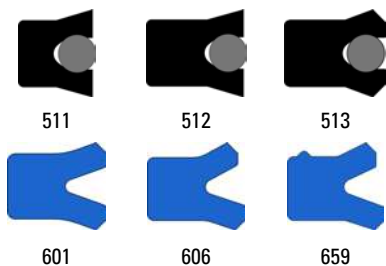
NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
511	5.250	4.750	0.250	0.275	8811910
513	5.250	4.750	0.250	0.275	8930810
513	5.250	4.750	0.375	0.413	8861910
513	5.250	4.750	0.500	0.550	8846310
512	5.250	4.750	0.563	0.619	8933410
513	5.250	4.750	0.563	0.619	8840910
511	5.250	4.875	0.188	0.207	8823610
512	5.250	4.875	0.250	0.275	8821510
513	5.250	4.875	0.280	0.308	8903510
513	5.250	4.875	0.375	0.413	8861810
511	5.375	4.750	0.313	0.344	8879710
513	5.375	4.750	0.500	0.550	8869310
513	5.375	4.750	0.625	0.688	8862410
511	5.375	4.875	0.250	0.275	8856510
513	5.375	4.875	0.375	0.413	8832910
513	5.375	4.875	0.563	0.619	8930910
513	5.375	5.000	0.375	0.413	8842510
511	5.500	4.250	0.625	0.688	8819810
511	5.500	4.500	0.500	0.550	8817410
513	5.500	4.500	0.500	0.550	8930510
513	5.500	4.500	0.750	0.825	8847310
511	5.500	4.750	0.375	0.413	8817510
513	5.500	4.750	0.375	0.413	8930610
601	5.500	4.750	0.360	0.437	4154701
513	5.500	4.750	0.500	0.550	8876310
512	5.500	4.750	0.625	0.688	8832210
513	5.500	4.750	0.625	0.688	8876410
606	5.500	4.750	0.625	0.688	4371200
511	5.500	4.875	0.313	0.343	8921610
511	5.500	5.000	0.250	0.275	8812010
513	5.500	5.000	0.250	0.275	8931210
512	5.500	5.000	0.375	0.413	8871510
513	5.500	5.000	0.375	0.413	8841010
513	5.500	5.000	0.500	0.550	8866810
512	5.500	5.000	0.563	0.619	8828810
513	5.500	5.000	0.563	0.619	8841110
511	5.500	5.125	0.188	0.207	8908510
511	5.625	5.000	0.313	0.344	8812110
513	5.625	5.000	0.625	0.688	8874710





TYPE	NOMINAL				PART No.
	ØD ₁	Ød ₁	SL	L ₁	
513	5.750	4.750	0.750	0.825	8930710
511	5.750	5.000	0.375	0.413	8817610
513	5.750	5.000	0.375	0.413	8931010
601	5.750	5.000	0.482	0.539	4224801
512	5.750	5.000	0.500	0.550	8879110
513	5.750	5.000	0.500	0.550	8876510
512	5.750	5.000	0.625	0.688	8832310
513	5.750	5.000	0.625	0.688	8843810
511	5.750	5.250	0.250	0.275	8812210
513	5.750	5.250	0.563	0.619	8862010
511	5.875	5.250	0.313	0.344	8856910
513	5.875	5.250	0.625	0.688	8862510
513	5.875	5.500	0.375	0.413	8905710
511	6.000	4.750	0.625	0.688	8819410
511	6.000	5.000	0.500	0.550	8817710
659	6.000	5.000	0.731	0.804	4530200
512	6.000	5.000	0.750	0.825	8832410
513	6.000	5.000	0.750	0.825	8907610
513	6.000	5.000	0.750	0.825	8931110
601	6.000	5.000	0.750	0.825	8901300
511	6.000	5.250	0.375	0.413	8817810
513	6.000	5.250	0.375	0.413	8931310
606	6.000	5.250	0.375	0.413	4517600
512	6.000	5.250	0.500	0.550	8905910
513	6.000	5.250	0.500	0.550	8865010
606	6.000	5.250	0.500	0.550	4445300
512	6.000	5.250	0.625	0.688	8832610
513	6.000	5.250	0.625	0.688	8843910
606	6.000	5.250	0.625	0.688	4371300
513	6.000	5.250	0.750	0.825	8854410
511	6.000	5.375	0.313	0.344	8812310
513	6.000	5.375	0.313	0.344	8931510
513	6.000	5.375	0.375	0.413	8931610
512	6.000	5.375	0.625	0.688	8872610
513	6.000	5.375	0.625	0.688	8841210
511	6.000	5.437	0.281	0.310	8921710
511	6.000	5.500	0.250	0.275	8812410
606	6.000	5.500	0.250	0.275	4517100
512	6.000	5.500	0.375	0.413	8829110

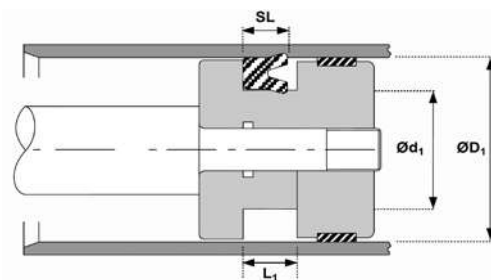
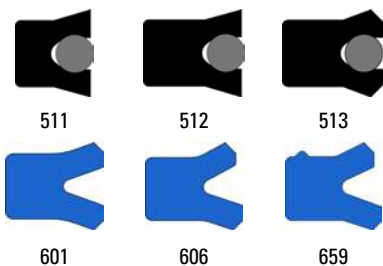
TYPE	NOMINAL				PART No.
	ØD ₁	Ød ₁	SL	L ₁	
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606	6.000	5.500	0.375	0.413	4365300
512	6.000	5.500	0.500	0.550	8922510
513	6.000	5.500	0.500	0.550	8833610
512	6.000	5.500	0.563	0.619	8829210
513	6.000	5.500	0.563	0.619	8841410
606	6.000	5.500	0.562	0.619	4393400
511	6.125	5.125	0.500	0.550	8851810
511	6.125	5.500	0.313	0.344	8812510
513	6.125	5.500	0.313	0.344	8931810
513	6.125	5.500	0.625	0.688	8933810
513	6.125	5.625	0.563	0.619	8903610
511	6.250	5.250	0.500	0.550	8900110
513	6.250	5.250	0.500	0.550	8931410
513	6.250	5.250	0.750	0.825	8847510
511	6.250	5.500	0.375	0.413	8818010
513	6.250	5.500	0.375	0.413	8931710
601	6.250	5.500	0.375	0.413	4119301
513	6.250	5.500	0.500	0.550	8863010
513	6.250	5.500	0.625	0.688	8844010
511	6.250	5.750	0.250	0.275	8812610
513	6.250	5.750	0.375	0.413	8866410
512	6.250	5.750	0.563	0.619	8905510
513	6.250	5.750	0.563	0.619	8841610
606	6.250	5.750	0.563	0.619	4458300
511	6.375	5.375	0.500	0.550	8863610
511	6.375	5.625	0.375	0.413	8814110
511	6.375	5.750	0.313	0.344	8857010
512	6.500	5.500	0.750	0.825	8823310
511	6.500	5.750	0.375	0.413	8818210
601	6.500	5.750	0.375	0.413	4135301
512	6.500	5.750	0.500	0.550	8829010
513	6.500	5.750	0.500	0.550	8866110
512	6.500	5.750	0.625	0.688	8832810
513	6.500	5.750	0.625	0.688	8878010
606	6.500	5.750	0.625	0.688	4743900
511	6.500	6.000	0.250	0.275	8812810
513	6.500	6.000	0.375	0.413	8852310
513	6.500	6.000	0.500	0.550	8867610



NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
512	6.500	6.000	0.563	0.619	8829310
513	6.500	6.000	0.563	0.619	8841710
513	6.625	5.875	0.625	0.688	8900410
511	6.625	6.000	0.313	0.344	8812910
513	6.625	6.000	0.625	0.688	8862610
511	6.750	6.000	0.375	0.413	8818310
513	6.750	6.000	0.375	0.413	8931910
513	6.750	6.000	0.500	0.550	8866210
512	6.750	6.000	0.625	0.688	8833010
513	6.750	6.000	0.625	0.688	8844110
511	6.750	6.250	0.250	0.275	8856610
513	6.750	6.250	0.563	0.619	8905610
511	6.875	6.250	0.313	0.344	8857110
511	7.000	6.000	0.500	0.550	8818410
659	7.000	6.000	0.731	0.804	4529700
512	7.000	6.000	0.750	0.825	8833110
513	7.000	6.000	0.750	0.825	8863410
513	7.000	6.000	0.750	0.825	8932010
511	7.000	6.250	0.375	0.413	8818510
606	7.000	6.250	0.375	0.413	4517700
512	7.000	6.250	0.500	0.550	8833210
513	7.000	6.250	0.500	0.550	8902410
606	7.000	6.250	0.500	0.550	4445500
512	7.000	6.250	0.625	0.688	8833310
513	7.000	6.250	0.625	0.688	8844210
606	7.000	6.250	0.625	0.688	4371400
511	7.000	6.375	0.313	0.344	8813010
512	7.000	6.375	0.625	0.688	8829410
513	7.000	6.375	0.625	0.688	8841810
511	7.000	6.500	0.250	0.275	8813110
513	7.000	6.500	0.250	0.275	8899410
606	7.000	6.500	0.250	0.275	4517200
512	7.000	6.500	0.375	0.413	8829510
513	7.000	6.500	0.375	0.413	8852610
606	7.000	6.500	0.375	0.413	4445400
513	7.000	6.500	0.500	0.550	8846410
512	7.000	6.500	0.563	0.619	8829710
513	7.000	6.500	0.563	0.619	8841910
511	7.125	6.500	0.313	0.344	8876610

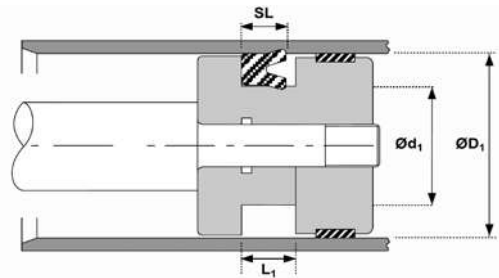
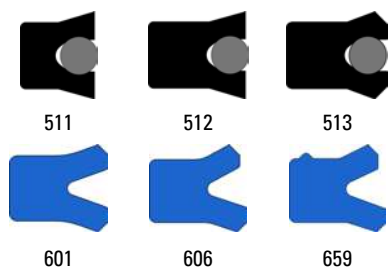
NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
513	7.125	6.500	0.625	0.688	8869110
511	7.250	6.250	0.500	0.550	8857810
513	7.250	6.250	0.750	0.825	8847710
511	7.250	6.500	0.375	0.413	8818610
513	7.250	6.500	0.375	0.413	8932110
513	7.250	6.500	0.500	0.550	8853310
512	7.250	6.500	0.625	0.688	8833410
513	7.250	6.500	0.625	0.688	8844310
511	7.250	6.750	0.250	0.275	8813210
513	7.250	6.750	0.375	0.413	8865910
513	7.250	6.750	0.500	0.550	8866010
513	7.250	6.750	0.563	0.619	8866310
511	7.375	6.750	0.313	0.344	8857210
513	7.375	6.750	0.625	0.688	8862710
511	7.500	6.500	0.500	0.550	8815210
511	7.500	6.750	0.375	0.413	8818810
513	7.500	6.750	0.375	0.413	8932210
513	7.500	6.750	0.500	0.550	8854610
512	7.500	6.750	0.625	0.688	8850810
513	7.500	6.750	0.625	0.688	8854710
511	7.500	7.000	0.250	0.275	8813310
601	7.500	7.000	0.250	0.275	4806200
512	7.500	7.000	0.375	0.413	8822610
513	7.500	7.000	0.375	0.413	8852410
513	7.500	7.000	0.500	0.550	8842410
512	7.500	7.000	0.563	0.619	8877210
513	7.500	7.000	0.563	0.619	8877910
511	7.625	7.000	0.313	0.344	8879310
512	7.625	7.000	0.625	0.688	8859710
513	7.625	7.000	0.625	0.688	8854810
511	7.750	6.500	0.625	0.688	8819910
511	7.750	7.000	0.375	0.413	8877010
512	7.750	7.000	0.500	0.550	8859810
513	7.750	7.000	0.500	0.550	8854010
512	7.750	7.000	0.625	0.688	8877610
513	7.750	7.000	0.625	0.688	8844410
511	7.750	7.250	0.250	0.275	8856710
513	7.750	7.250	0.563	0.619	8862110
511	7.875	7.250	0.313	0.344	8857310



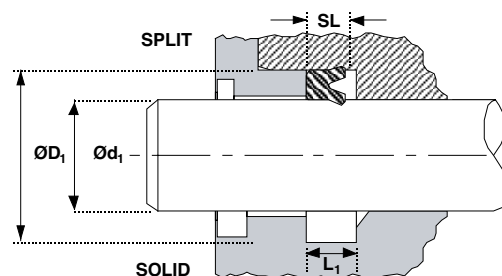
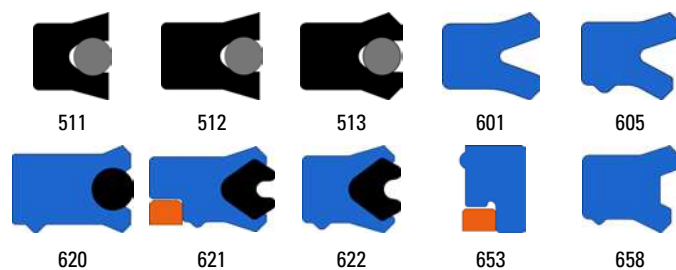


NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
513	7.875	7.250	0.625	0.688	8862810
511	8.000	6.750	0.625	0.688	8819510
511	8.000	7.000	0.500	0.550	8851310
512	8.000	7.000	0.750	0.825	8851910
513	8.000	7.000	0.750	0.825	8870410
511	8.000	7.250	0.375	0.413	8818910
513	8.000	7.250	0.375	0.413	8932310
513	8.000	7.250	0.500	0.550	8865110
512	8.000	7.250	0.625	0.688	8833510
513	8.000	7.250	0.625	0.688	8844510
606	8.000	7.250	0.625	0.688	4371500
513	8.000	7.250	0.750	0.825	8854510
511	8.000	7.375	0.313	0.344	8876710
513	8.000	7.375	0.500	0.550	8842610
512	8.000	7.375	0.625	0.688	8855310
513	8.000	7.375	0.625	0.688	8864910
511	8.000	7.500	0.250	0.275	8813410
513	8.000	7.500	0.250	0.275	8932410
606	8.000	7.500	0.250	0.275	4517300
512	8.000	7.500	0.375	0.413	8829610
513	8.000	7.500	0.375	0.413	8852510
513	8.000	7.500	0.500	0.550	8833810
512	8.000	7.500	0.563	0.619	8877310
513	8.000	7.500	0.563	0.619	8852810
511	8.125	7.500	0.313	0.344	8813510
511	8.250	7.250	0.500	0.550	8857910
513	8.250	7.250	0.750	0.825	8847810
511	8.250	7.500	0.375	0.413	8877110
513	8.250	7.500	0.500	0.550	8863210
513	8.250	7.500	0.625	0.688	8878110
511	8.250	7.750	0.250	0.275	8921810
511	8.375	7.375	0.500	0.550	8863910
511	8.375	7.625	0.375	0.413	8814010
511	8.375	7.750	0.313	0.344	8857410
511	8.500	7.500	0.500	0.550	8851610
512	8.500	7.500	0.750	0.825	8820410
511	8.500	7.750	0.375	0.413	8853910
513	8.500	7.750	0.500	0.550	8865210
512	8.500	7.750	0.625	0.688	8859910

NOMINAL					
TYPE	ØD ₁	Ød ₁	SL	L ₁	PART No.
513	8.500	7.750	0.625	0.688	8853610
511	8.500	8.000	0.250	0.275	8813610
513	8.500	8.000	0.250	0.275	8904610
513	8.500	8.000	0.375	0.413	8848210
513	8.500	8.000	0.563	0.619	8842310
511	8.625	8.000	0.313	0.344	8876910
513	8.625	8.000	0.500	0.550	8866610
513	8.625	8.000	0.625	0.688	8904810
601	8.750	7.750	0.500	0.550	4806100
513	8.750	7.750	0.750	0.825	8847910
511	8.750	8.000	0.375	0.413	8869210
513	8.750	8.000	0.625	0.688	8878210
511	8.750	8.250	0.250	0.275	8856810
511	8.875	8.250	0.313	0.344	8857510
511	9.000	8.000	0.500	0.550	8819010
512	9.000	8.000	0.750	0.825	8855210
513	9.000	8.000	0.750	0.825	8863510
606	9.000	8.000	0.750	0.825	4371600
511	9.000	8.250	0.375	0.413	8851410
512	9.000	8.250	0.500	0.550	8860010
512	9.000	8.250	0.625	0.688	8853710
513	9.000	8.250	0.625	0.688	8854110
511	9.000	8.500	0.250	0.275	8813710
512	9.000	8.500	0.375	0.413	8829810
513	9.000	8.500	0.375	0.413	8852710
513	9.000	8.500	0.500	0.550	8833910
512	9.000	8.500	0.563	0.619	8855110
513	9.000	8.500	0.563	0.619	8853010
511	9.125	8.125	0.500	0.550	8853810
511	9.125	8.500	0.313	0.344	8857610
513	9.125	8.500	0.625	0.688	8862910
512	9.250	8.250	0.750	0.825	8904710
511	9.500	8.750	0.375	0.413	8921910
513	9.500	8.750	0.500	0.550	8934810
513	9.750	9.000	0.375	0.413	8932510
511	10.000	9.000	0.500	0.550	8905410
512	10.000	9.000	0.750	0.825	8922610
606	10.000	9.000	0.750	0.825	4536200
606	10.000	9.250	0.375	0.413	4575100

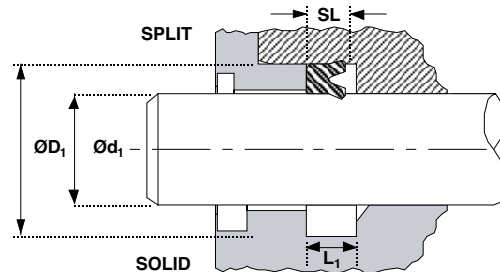
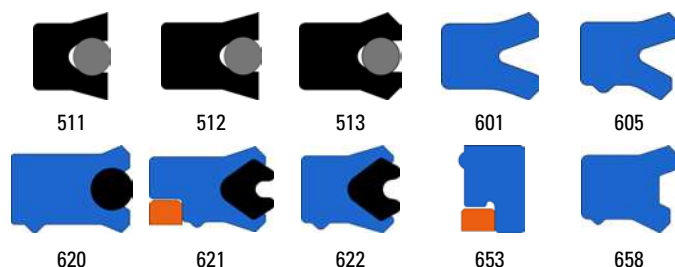


TYPE	NOMINAL				PART No.
	ØD ₁	Ød ₁	SL	L ₁	
513	10.000	9.500	0.563	0.619	8932610
513	10.250	9.500	0.625	0.688	8933710
513	10.500	10.000	0.563	0.619	8932710
511	10.750	10.000	0.375	0.413	8922010
512	11.000	10.000	0.750	0.825	8922710
513	11.000	10.250	0.500	0.550	8934710
511	11.750	11.000	0.375	0.413	8922110
512	12.000	11.000	0.750	0.825	8922810
511	12.000	11.500	0.250	0.275	8922210



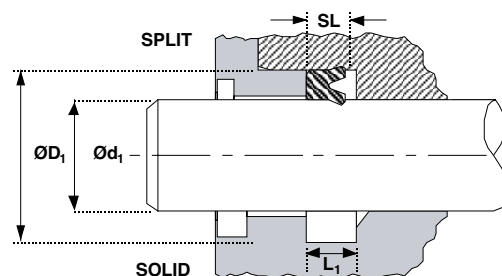
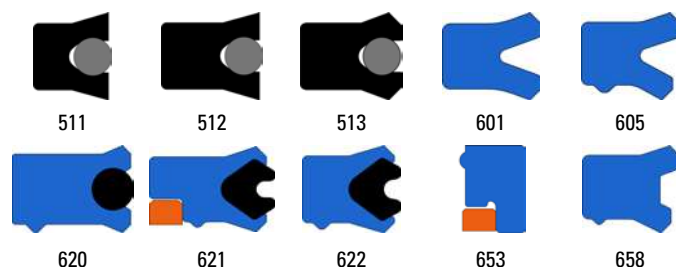
NOMINAL					
TYPE	Ød ₁	ØD ₁	SL	L ₁	PART No.
511	0.063	0.313	0.125	0.138	8920810
511	0.125	0.375	0.125	0.138	8900810
513	0.125	0.375	0.250	0.275	8922910
511	0.188	0.438	0.125	0.138	8800110
513	0.188	0.438	0.250	0.275	8923010
513	0.188	0.563	0.188	0.207	8923110
511	0.250	0.500	0.125	0.138	8800210
513	0.250	0.500	0.125	0.138	8933610
513	0.250	0.500	0.188	0.207	8845910
512	0.250	0.500	0.250	0.275	8820210
513	0.250	0.500	0.250	0.275	8878510
513	0.250	0.625	0.188	0.207	8923210
511	0.250	0.875	0.312	0.344	8899710
511	0.313	0.563	0.125	0.138	8902810
513	0.313	0.563	0.125	0.138	8923310
513	0.313	0.563	0.250	0.275	8923510
513	0.313	0.688	0.188	0.207	8923410
511	0.313	0.813	0.250	0.275	8824710
511	0.375	0.625	0.125	0.138	8800410
513	0.375	0.625	0.125	0.138	8908610
513	0.375	0.625	0.188	0.207	8923610
605	0.375	0.625	0.198	0.218	4544300
513	0.375	0.625	0.250	0.275	8823810
513	0.375	0.750	0.156	0.172	8901410
511	0.375	0.750	0.188	0.207	8902910
605	0.375	0.750	0.312	0.344	4710500
511	0.375	0.875	0.250	0.275	8865810
511	0.375	1.000	0.313	0.344	8824910
511	0.438	0.688	0.125	0.138	8905110
513	0.438	0.688	0.125	0.138	8902510
513	0.438	0.688	0.250	0.275	8846910
513	0.438	0.938	0.375	0.413	8863110
511	0.500	0.750	0.125	0.138	8800610
513	0.500	0.750	0.125	0.138	8907910
605	0.500	0.750	0.187	0.207	4576100
512	0.500	0.750	0.250	0.275	8870510
513	0.500	0.750	0.250	0.275	8834010
601	0.500	0.750	0.250	0.275	4566500
511	0.500	0.875	0.188	0.207	8800710
601	0.500	0.875	0.197	0.218	4300000

NOMINAL					
TYPE	Ød ₁	ØD ₁	SL	L ₁	PART No.
513	0.500	0.875	0.250	0.275	8848010
513	0.500	0.875	0.313	0.344	8852910
511	0.500	1.000	0.250	0.275	8806310
601	0.500	1.000	0.250	0.275	4110201
512	0.500	1.000	0.375	0.413	8922310
513	0.500	1.000	0.375	0.413	8837710
605	0.562	0.813	0.187	0.207	4576200
511	0.563	0.813	0.125	0.138	8844610
513	0.563	0.813	0.125	0.138	8923710
511	0.563	0.938	0.188	0.207	8932810
511	0.625	0.875	0.125	0.138	8800810
513	0.625	0.875	0.125	0.138	8906210
620	0.625	0.875	0.160	0.176	4498600
620	0.625	0.875	0.175	0.190	4528700
513	0.625	0.875	0.188	0.207	8848710
605	0.625	0.875	0.187	0.207	4493700
605	0.625	0.875	0.241	0.265	4329000
512	0.625	0.875	0.250	0.275	8820510
513	0.625	0.875	0.250	0.275	8834110
620	0.625	0.875	0.250	0.275	4459900
511	0.625	1.000	0.188	0.207	8800910
513	0.625	1.000	0.188	0.207	8923810
601	0.625	1.000	0.190	0.218	4298300
605	0.625	1.000	0.281	0.312	4447200
513	0.625	1.000	0.313	0.344	8902710
511	0.625	1.125	0.250	0.275	8806410
601	0.625	1.125	0.250	0.275	4509101
513	0.625	1.125	0.313	0.344	8849210
513	0.625	1.125	0.375	0.413	8923910
511	0.688	0.938	0.125	0.138	8801010
605	0.688	0.938	0.187	0.207	4572000
512	0.688	1.188	0.375	0.413	8906110
511	0.688	1.313	0.312	0.344	8906710
658	0.750	0.937	0.156	0.172	4472400
511	0.750	1.000	0.125	0.138	8801110
513	0.750	1.000	0.125	0.138	8905310
605	0.750	1.000	0.125	0.138	4552900
605	0.750	1.000	0.187	0.207	4571000
620	0.750	1.000	0.187	0.207	4583900
512	0.750	1.000	0.250	0.275	8820710



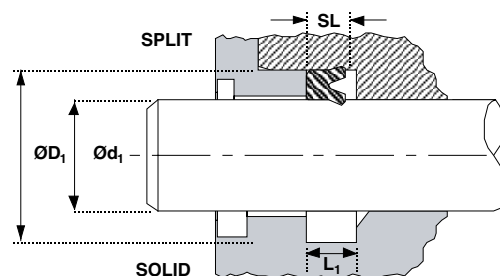
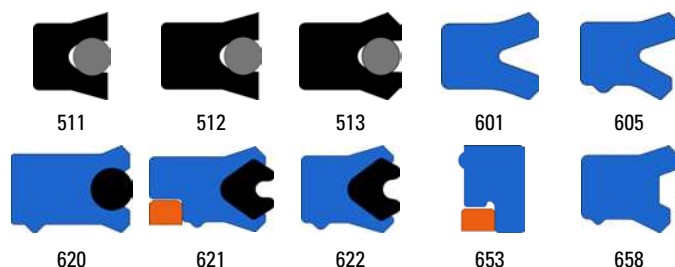
NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
513	0.750	1.000	0.250	0.275	8834210
605	0.750	1.000	0.250	0.275	4345100
620	0.750	1.000	0.250	0.275	4498500
511	0.750	1.125	0.188	0.207	8801210
513	0.750	1.125	0.188	0.207	8849810
513	0.750	1.125	0.250	0.275	8846010
512	0.750	1.125	0.313	0.344	8820810
513	0.750	1.125	0.313	0.344	8834310
605	0.750	1.125	0.312	0.344	4512200
513	0.750	1.125	0.375	0.413	8855810
511	0.750	1.250	0.250	0.275	8806510
513	0.750	1.250	0.250	0.275	8924010
601	0.750	1.250	0.250	0.275	4102901
512	0.750	1.250	0.375	0.413	8825010
513	0.750	1.250	0.375	0.413	8837810
511	0.813	1.063	0.125	0.138	8815310
513	0.813	1.063	0.125	0.138	8924110
605	0.813	1.063	0.187	0.207	4576300
513	0.813	1.063	0.250	0.275	8924210
605	0.813	1.063	0.250	0.275	4558700
511	0.875	1.125	0.125	0.138	8801410
513	0.875	1.125	0.125	0.138	8924310
605	0.875	1.125	0.187	0.207	4576400
620	0.875	1.125	0.187	0.207	4709100
658	0.875	1.125	0.187	0.207	4527500
513	0.875	1.125	0.250	0.275	8845310
605	0.875	1.125	0.250	0.275	4442500
511	0.875	1.250	0.188	0.207	8801510
513	0.875	1.250	0.188	0.207	8924410
513	0.875	1.250	0.313	0.344	8900210
605	0.875	1.250	0.324	0.356	4794500
512	0.875	1.250	0.375	0.413	8933110
511	0.875	1.375	0.250	0.275	8806610
513	0.875	1.375	0.250	0.275	8924510
601	0.875	1.375	0.250	0.275	4507101
512	0.875	1.375	0.313	0.344	8906810
513	0.875	1.375	0.313	0.344	8830210
605	0.875	1.375	0.341	0.375	4373100
513	0.875	1.375	0.375	0.413	8864610

NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
511	0.875	1.500	0.313	0.344	8920910
511	0.875	1.625	0.375	0.413	8933210
511	0.938	1.188	0.125	0.138	8844810
513	0.938	1.188	0.125	0.138	8924610
513	0.938	1.188	0.250	0.275	8900910
513	0.938	1.313	0.313	0.344	8924710
511	0.938	1.438	0.250	0.275	8921010
605	1.000	1.240	0.192	0.211	4371800
620	1.000	1.240	0.187	0.217	4477200
511	1.000	1.250	0.125	0.138	8801610
513	1.000	1.250	0.125	0.138	8924810
620	1.000	1.250	0.187	0.197	4457500
513	1.000	1.250	0.188	0.207	8860110
605	1.000	1.250	0.187	0.207	4442600
658	1.000	1.250	0.187	0.207	4569000
512	1.000	1.250	0.250	0.275	8821210
513	1.000	1.250	0.250	0.275	8834410
605	1.000	1.250	0.250	0.275	4345200
620	1.000	1.250	0.250	0.275	4498400
605	1.000	1.312	0.219	0.241	4493800
511	1.000	1.313	0.156	0.172	8810110
513	1.000	1.313	0.156	0.172	8925010
511	1.000	1.375	0.188	0.207	8801710
513	1.000	1.375	0.188	0.207	8806110
605	1.000	1.375	0.187	0.207	4801700
513	1.000	1.375	0.250	0.275	8860510
605	1.000	1.375	0.250	0.275	4456800
620	1.000	1.375	0.250	0.275	4410400
513	1.000	1.375	0.281	0.310	8925110
512	1.000	1.375	0.313	0.344	8821310
513	1.000	1.375	0.313	0.344	8834510
605	1.000	1.375	0.312	0.344	4345900
620	1.000	1.375	0.312	0.344	4584000
511	1.000	1.500	0.250	0.275	8806810
513	1.000	1.500	0.250	0.275	8924910
601	1.000	1.500	0.250	0.275	4111101
605	1.000	1.500	0.255	0.275	4430200
512	1.000	1.500	0.313	0.344	8906910
605	1.000	1.500	0.341	0.375	4330100



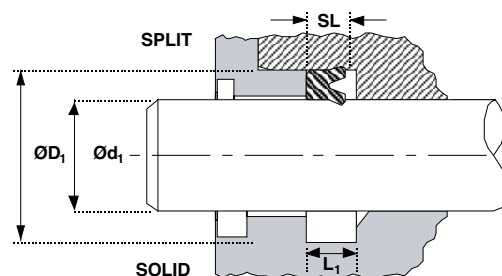
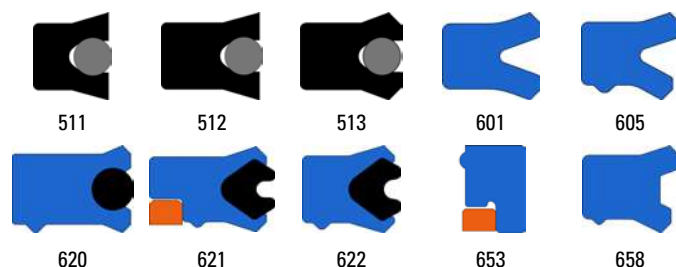
NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
512	1.000	1.500	0.375	0.413	8825210
513	1.000	1.500	0.375	0.413	8837910
605	1.000	1.500	0.375	0.413	4308400
512	1.000	1.500	0.437	0.480	8907210
511	1.000	1.625	0.313	0.344	8806910
513	1.000	1.625	0.375	0.413	8828310
512	1.000	1.625	0.500	0.550	8825310
513	1.000	1.625	0.500	0.550	8838010
511	1.000	1.750	0.375	0.413	8819110
658	1.062	1.302	0.187	0.207	4549400
605	1.063	1.302	0.187	0.207	4410300
511	1.063	1.313	0.125	0.138	8801810
513	1.063	1.313	0.125	0.138	8925210
513	1.063	1.313	0.250	0.275	8845710
605	1.063	1.313	0.250	0.275	4394500
513	1.063	1.438	0.313	0.344	8850010
605	1.125	1.365	0.192	0.211	4384500
658	1.125	1.367	0.187	0.207	4466200
511	1.125	1.375	0.125	0.138	8801910
513	1.125	1.375	0.125	0.138	8899910
513	1.125	1.375	0.188	0.207	8855510
605	1.125	1.375	0.187	0.207	4442700
512	1.125	1.375	0.250	0.275	8854910
513	1.125	1.375	0.250	0.275	8855610
605	1.125	1.375	0.250	0.275	4388000
620	1.125	1.375	0.250	0.275	4461100
513	1.125	1.375	0.313	0.344	8848810
605	1.125	1.399	0.192	0.211	4371900
511	1.125	1.500	0.188	0.207	8802010
513	1.125	1.500	0.188	0.207	8907710
512	1.125	1.500	0.250	0.275	8820610
513	1.125	1.500	0.250	0.275	8844910
620	1.125	1.500	0.250	0.275	4410500
512	1.125	1.500	0.313	0.344	8821710
513	1.125	1.500	0.313	0.344	8834610
605	1.125	1.500	0.312	0.344	4392600
605	1.125	1.562	0.325	0.360	4568800
511	1.125	1.625	0.250	0.275	8807010
513	1.125	1.625	0.250	0.275	8804910

NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
605	1.125	1.625	0.250	0.275	4370900
512	1.125	1.625	0.375	0.413	8847610
513	1.125	1.625	0.375	0.413	8856110
511	1.125	1.750	0.313	0.344	8807110
513	1.125	1.750	0.313	0.344	8925310
605	1.125	1.750	0.397	0.437	4373000
513	1.125	1.750	0.500	0.550	8879810
511	1.125	1.875	0.375	0.413	8921110
511	1.187	1.500	0.156	0.172	8811010
605	1.187	1.562	0.250	0.275	4458600
511	1.188	1.438	0.125	0.138	8921310
512	1.188	1.438	0.188	0.207	8858010
513	1.188	1.438	0.250	0.275	8848910
511	1.188	1.563	0.188	0.207	8851710
513	1.188	1.563	0.188	0.207	8925410
513	1.188	1.563	0.313	0.344	8902310
511	1.188	1.688	0.250	0.275	8921210
511	1.188	1.813	0.313	0.344	8933010
658	1.250	1.490	0.197	0.217	4359610
511	1.250	1.500	0.125	0.138	8802210
513	1.250	1.500	0.125	0.138	8925510
513	1.250	1.500	0.188	0.207	8860210
605	1.250	1.500	0.187	0.207	4359600
620	1.250	1.500	0.187	0.207	4398900
512	1.250	1.500	0.250	0.275	8821810
513	1.250	1.500	0.250	0.275	8834710
605	1.250	1.500	0.250	0.275	4345300
620	1.250	1.500	0.250	0.275	4461000
511	1.250	1.563	0.156	0.172	8813810
511	1.250	1.625	0.188	0.207	8802310
513	1.250	1.625	0.188	0.207	8925610
605	1.250	1.625	0.187	0.207	4552600
605	1.250	1.625	0.227	0.250	4330200
513	1.250	1.625	0.250	0.275	8860610
605	1.250	1.625	0.250	0.275	4460600
621	1.250	1.625	0.250	0.275	4794110
512	1.250	1.625	0.313	0.344	8821910
513	1.250	1.625	0.313	0.344	8834810
605	1.250	1.625	0.312	0.344	4346000



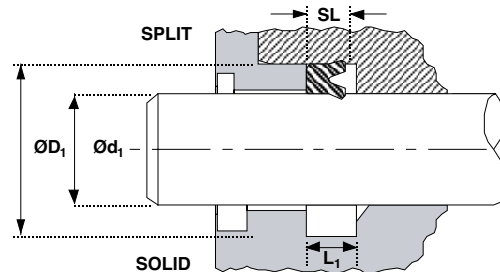
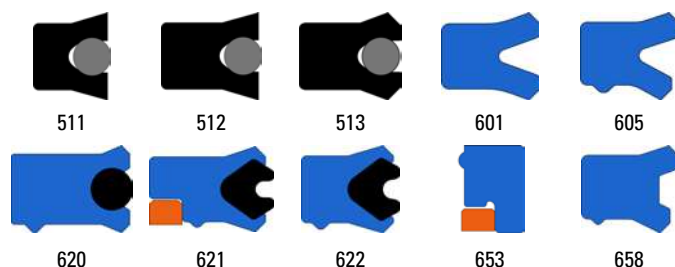
NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
620	1.250	1.625	0.312	0.344	4410600
621	1.250	1.625	0.313	0.344	4809910
513	1.250	1.625	0.375	0.413	8860710
658	1.250	1.625	0.375	0.413	4747600
653	1.250	1.674		0.166	4878110
511	1.250	1.750	0.250	0.275	8807210
513	1.250	1.750	0.250	0.275	8925710
601	1.250	1.750	0.250	0.275	4502701
605	1.250	1.750	0.250	0.275	4513500
512	1.250	1.750	0.375	0.413	8825410
513	1.250	1.750	0.375	0.413	8838110
601	1.250	1.750	0.375	0.413	4107001
605	1.250	1.750	0.375	0.413	4335800
511	1.250	1.875	0.313	0.344	8870010
513	1.250	1.875	0.313	0.344	8809810
605	1.250	1.875	0.397	0.437	4330300
513	1.250	1.875	0.500	0.550	8838210
511	1.250	2.000	0.375	0.413	8814310
513	1.250	2.000	0.375	0.413	8925810
513	1.250	2.000	0.500	0.550	8842010
513	1.313	1.563	0.125	0.138	8926010
513	1.313	1.688	0.313	0.344	8925910
513	1.313	1.813	0.375	0.413	8902610
658	1.375	1.615	0.197	0.217	4392210
511	1.375	1.625	0.125	0.138	8802410
513	1.375	1.625	0.125	0.138	8926210
513	1.375	1.625	0.188	0.207	8860310
605	1.375	1.625	0.187	0.207	4392200
512	1.375	1.625	0.250	0.275	8822110
513	1.375	1.625	0.250	0.275	8834910
605	1.375	1.625	0.250	0.275	4345400
605	1.375	1.687	0.219	0.241	4493900
511	1.375	1.688	0.156	0.172	8813910
513	1.375	1.688	0.156	0.172	8926410
511	1.375	1.750	0.188	0.207	8802510
513	1.375	1.750	0.188	0.207	8926110
605	1.375	1.750	0.187	0.207	4552800
513	1.375	1.750	0.250	0.275	8844710
512	1.375	1.750	0.313	0.344	8822210
513	1.375	1.750	0.313	0.344	8835010

NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
605	1.375	1.750	0.312	0.344	4346100
620	1.375	1.750	0.312	0.344	4410700
512	1.375	1.750	0.375	0.413	8870710
513	1.375	1.750	0.375	0.413	8835110
601	1.375	1.750	0.375	0.413	4353400
658	1.375	1.750	0.375	0.413	4747700
511	1.375	1.875	0.250	0.275	8807310
513	1.375	1.875	0.250	0.275	8926310
512	1.375	1.875	0.375	0.413	8825610
513	1.375	1.875	0.375	0.413	8878610
605	1.375	1.875	0.375	0.413	4403100
621	1.375	1.875	0.375	0.413	4707710
601	1.375	2.000	0.266	0.312	4236201
511	1.375	2.000	0.313	0.344	8807410
513	1.375	2.000	0.313	0.344	8825110
605	1.375	2.000	0.397	0.437	4330400
512	1.375	2.000	0.500	0.550	8871610
513	1.375	2.000	0.500	0.550	8873510
511	1.375	2.125	0.375	0.413	8814410
513	1.375	2.125	0.625	0.688	8933510
605	1.437	1.812	0.312	0.344	4442800
513	1.438	1.688	0.125	0.138	8926510
513	1.438	1.688	0.250	0.275	8849010
658	1.500	1.740	0.187	0.207	4480600
511	1.500	1.750	0.125	0.138	8802610
513	1.500	1.750	0.125	0.138	8926610
512	1.500	1.750	0.250	0.275	8822310
513	1.500	1.750	0.250	0.275	8835210
605	1.500	1.750	0.250	0.275	4345500
511	1.500	1.875	0.188	0.207	8802710
513	1.500	1.875	0.188	0.207	8851510
605	1.500	1.875	0.187	0.207	4576600
513	1.500	1.875	0.250	0.275	8835310
605	1.500	1.875	0.250	0.275	4322100
621	1.500	1.875	0.250	0.275	4484410
658	1.500	1.875	0.295	0.324	4386020
513	1.500	1.875	0.313	0.344	8849710
605	1.500	1.875	0.312	0.344	4346200
621	1.500	1.875	0.312	0.344	4484510
622	1.500	1.875	0.312	0.344	8904010



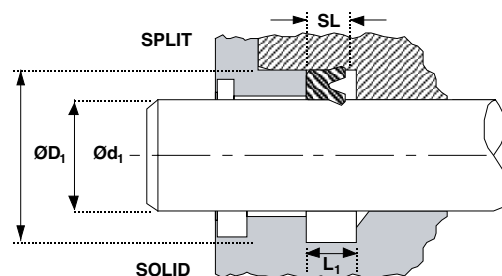
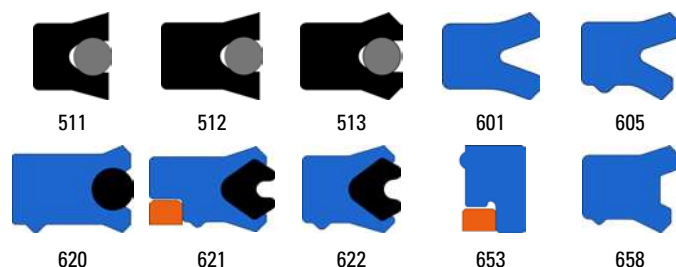
NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
512	1.500	1.875	0.375	0.413	8822510
513	1.500	1.875	0.375	0.413	8835410
605	1.500	1.875	0.375	0.413	4385400
620	1.500	1.875	0.375	0.413	4750600
658	1.500	1.875	0.375	0.413	4747800
513	1.500	1.875	0.406	0.447	8848110
511	1.500	2.000	0.203	0.223	8801310
511	1.500	2.000	0.250	0.275	8807510
513	1.500	2.000	0.250	0.275	8908410
601	1.500	2.000	0.250	0.275	4111001
605	1.500	2.000	0.250	0.275	4394400
512	1.500	2.000	0.313	0.344	8821010
513	1.500	2.000	0.313	0.344	8867710
605	1.500	2.000	0.341	0.375	4330500
512	1.500	2.000	0.375	0.413	8825710
513	1.500	2.000	0.375	0.413	8838310
605	1.500	2.000	0.375	0.413	4322200
621	1.500	2.000	0.375	0.413	4484910
622	1.500	2.000	0.375	0.413	8904110
511	1.500	2.125	0.313	0.344	8807610
513	1.500	2.125	0.313	0.344	8926710
513	1.500	2.125	0.375	0.413	8846510
605	1.500	2.125	0.375	0.413	4442900
605	1.500	2.125	0.397	0.437	4330600
512	1.500	2.125	0.500	0.550	8825810
513	1.500	2.125	0.500	0.550	8838410
511	1.500	2.250	0.375	0.413	8814510
512	1.500	2.250	0.500	0.550	8872710
513	1.500	2.250	0.500	0.550	8874810
512	1.500	2.250	0.625	0.688	8872810
513	1.500	2.250	0.625	0.688	8842710
511	1.500	2.500	0.500	0.550	8814610
512	1.500	2.500	0.750	0.825	8820310
511	1.625	1.875	0.125	0.138	8802810
513	1.625	1.875	0.125	0.138	8926910
513	1.625	1.875	0.188	0.207	8849110
512	1.625	1.875	0.250	0.275	8870610
513	1.625	1.875	0.250	0.275	8873110
605	1.625	1.875	0.250	0.275	4345600
511	1.625	2.000	0.188	0.207	8802910

NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
513	1.625	2.000	0.188	0.207	8926810
512	1.625	2.000	0.250	0.275	8908210
513	1.625	2.000	0.250	0.275	8868410
605	1.625	2.000	0.281	0.312	4542800
512	1.625	2.000	0.313	0.344	8858110
513	1.625	2.000	0.313	0.344	8864210
605	1.625	2.000	0.312	0.344	4443000
512	1.625	2.000	0.375	0.413	8822710
513	1.625	2.000	0.375	0.413	8835510
605	1.625	2.000	0.375	0.413	4443100
511	1.625	2.125	0.250	0.275	8807710
513	1.625	2.125	0.375	0.413	8849610
605	1.625	2.125	0.375	0.413	4512100
511	1.625	2.250	0.313	0.344	8850910
511	1.625	2.375	0.375	0.413	8814710
513	1.625	2.375	0.375	0.413	8901010
511	1.750	2.000	0.125	0.138	8803010
513	1.750	2.000	0.125	0.138	8927210
512	1.750	2.000	0.250	0.275	8822810
513	1.750	2.000	0.250	0.275	8835610
605	1.750	2.000	0.250	0.275	4345700
658	1.750	2.118	0.283	0.311	4456200
511	1.750	2.125	0.188	0.207	8803110
513	1.750	2.125	0.188	0.207	8927010
513	1.750	2.125	0.230	0.250	8852010
513	1.750	2.125	0.250	0.275	8927110
605	1.750	2.125	0.250	0.275	4357200
621	1.750	2.125	0.250	0.275	4484610
513	1.750	2.125	0.313	0.344	8865410
605	1.750	2.125	0.312	0.344	4346300
512	1.750	2.125	0.375	0.413	8822910
513	1.750	2.125	0.375	0.413	8835710
605	1.750	2.125	0.375	0.413	4366800
620	1.750	2.125	0.375	0.413	4460000
621	1.750	2.125	0.375	0.413	4484710
622	1.750	2.125	0.375	0.413	8904210
511	1.750	2.250	0.250	0.275	8807810
513	1.750	2.250	0.250	0.275	8805610
601	1.750	2.250	0.250	0.275	4502601
605	1.750	2.250	0.250	0.275	4552700



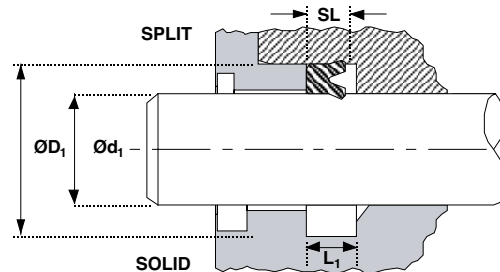
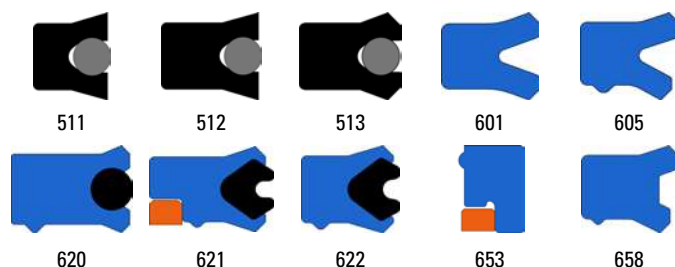
NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
605	1.750	2.250	0.341	0.375	4330700
512	1.750	2.250	0.375	0.413	8825910
513	1.750	2.250	0.375	0.413	8838510
601	1.750	2.250	0.375	0.413	4140901
605	1.750	2.250	0.375	0.413	4337000
621	1.750	2.250	0.375	0.413	4485010
622	1.750	2.250	0.375	0.413	8904310
605	1.750	2.250	0.500	0.550	4376800
601	1.750	2.375	0.266	0.312	4236301
511	1.750	2.375	0.313	0.344	8807910
513	1.750	2.375	0.375	0.413	8868810
605	1.750	2.375	0.437	0.481	4443200
512	1.750	2.375	0.500	0.550	8826010
513	1.750	2.375	0.500	0.550	8873610
601	1.750	2.375	0.562	0.619	4250901
511	1.750	2.500	0.375	0.413	8814810
512	1.750	2.500	0.500	0.550	8830010
513	1.750	2.500	0.500	0.550	8874910
513	1.750	2.500	0.625	0.688	8875010
513	1.750	2.750	0.750	0.825	8847010
511	1.875	2.125	0.125	0.138	8803210
513	1.875	2.125	0.188	0.207	8845810
513	1.875	2.125	0.250	0.275	8845410
658	1.875	2.246	0.281	0.311	4576700
511	1.875	2.250	0.188	0.207	8803310
513	1.875	2.250	0.188	0.207	8927310
605	1.875	2.250	0.312	0.344	4834600
512	1.875	2.250	0.375	0.413	8870810
513	1.875	2.250	0.375	0.413	8835810
605	1.875	2.250	0.375	0.413	4476200
511	1.875	2.375	0.250	0.275	8808010
513	1.875	2.375	0.375	0.413	8859410
605	1.875	2.375	0.375	0.413	4391200
511	1.875	2.500	0.313	0.344	8808110
605	1.875	2.500	0.397	0.437	4331500
512	1.875	2.500	0.500	0.550	8826110
513	1.875	2.500	0.500	0.550	8873710
511	1.875	2.875	0.500	0.550	8825510
511	2.000	2.250	0.125	0.138	8803410
513	2.000	2.250	0.188	0.207	8860410

NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
512	2.000	2.250	0.250	0.275	8823110
513	2.000	2.250	0.250	0.275	8873210
605	2.000	2.250	0.250	0.275	4345800
658	2.000	2.370	0.281	0.311	4466300
511	2.000	2.375	0.188	0.207	8803510
513	2.000	2.375	0.188	0.207	8927410
513	2.000	2.375	0.230	0.250	8806210
513	2.000	2.375	0.250	0.275	8868110
601	2.000	2.375	0.250	0.275	4508301
605	2.000	2.375	0.250	0.275	4458700
513	2.000	2.375	0.266	0.292	8927710
513	2.000	2.375	0.313	0.344	8860810
601	2.000	2.375	0.312	0.344	4509201
605	2.000	2.375	0.312	0.344	4346400
512	2.000	2.375	0.375	0.413	8823210
513	2.000	2.375	0.375	0.413	8835910
605	2.000	2.375	0.375	0.413	4380100
621	2.000	2.375	0.375	0.413	4484810
653	2.000	2.424		0.166	4521310
511	2.000	2.500	0.250	0.275	8808210
513	2.000	2.500	0.250	0.275	8856010
605	2.000	2.500	0.250	0.275	4496900
620	2.000	2.500	0.250	0.275	8907600
605	2.000	2.500	0.312	0.344	4382900
605	2.000	2.500	0.341	0.375	4330900
512	2.000	2.500	0.375	0.413	8826210
513	2.000	2.500	0.375	0.413	8838610
601	2.000	2.500	0.375	0.413	4353500
605	2.000	2.500	0.375	0.413	4337100
621	2.000	2.500	0.375	0.413	4485110
622	2.000	2.500	0.375	0.413	8904410
605	2.000	2.500	0.781	0.859	4491400
511	2.000	2.625	0.313	0.344	8808310
605	2.000	2.625	0.312	0.344	4333100
605	2.000	2.625	0.397	0.437	4331000
512	2.000	2.625	0.500	0.550	8826310
513	2.000	2.625	0.500	0.550	8873810
601	2.000	2.625	0.500	0.550	4225101
605	2.000	2.625	0.500	0.550	4346500
513	2.000	2.625	0.563	0.619	8862210



NOMINAL					
TYPE	ϕd_1	ϕD_1	SL	L_1	PART No.
601	2.000	2.625	0.562	0.619	4159801
511	2.000	2.750	0.375	0.413	8814910
513	2.000	2.750	0.375	0.413	8927610
512	2.000	2.750	0.500	0.550	8830310
513	2.000	2.750	0.500	0.550	8875110
512	2.000	2.750	0.625	0.688	8830410
513	2.000	2.750	0.625	0.688	8842810
605	2.000	2.750	0.625	0.688	4347300
511	2.000	3.000	0.500	0.550	8815010
513	2.000	3.000	0.500	0.550	8927510
512	2.000	3.000	0.750	0.825	8853410
513	2.000	3.000	0.750	0.825	8876810
513	2.125	2.375	0.250	0.275	8908910
511	2.125	2.500	0.188	0.207	8803710
513	2.125	2.500	0.188	0.207	8908110
512	2.125	2.500	0.250	0.275	8865510
513	2.125	2.500	0.250	0.275	8845010
601	2.125	2.500	0.250	0.275	4508201
512	2.125	2.500	0.375	0.413	8870910
513	2.125	2.500	0.375	0.413	8836010
605	2.125	2.500	0.375	0.413	4443300
511	2.125	2.625	0.250	0.275	8808410
513	2.125	2.625	0.250	0.275	8805810
512	2.125	2.625	0.375	0.413	8826410
513	2.125	2.625	0.375	0.413	8856310
601	2.125	2.625	0.375	0.413	4156101
621	2.125	2.625	0.375	0.413	4592510
511	2.125	2.750	0.313	0.344	8808510
513	2.125	2.750	0.313	0.344	8927810
513	2.125	2.750	0.500	0.550	8879910
513	2.125	2.750	0.625	0.688	8864810
511	2.125	2.875	0.375	0.413	8815110
511	2.125	3.125	0.500	0.550	8853110
512	2.188	2.563	0.375	0.413	8858210
511	2.250	2.500	0.125	0.138	8803810
513	2.250	2.500	0.250	0.275	8908810
511	2.250	2.625	0.188	0.207	8803910
513	2.250	2.625	0.188	0.207	8927910
512	2.250	2.625	0.313	0.344	8858310
513	2.250	2.625	0.313	0.344	8860910

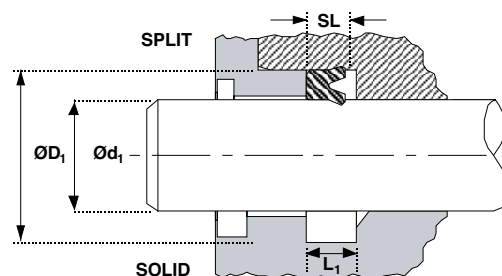
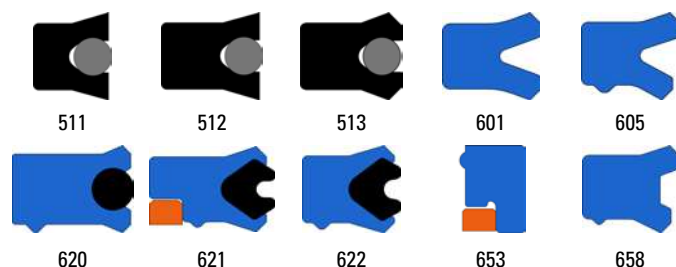
NOMINAL					
TYPE	ϕd_1	ϕD_1	SL	L_1	PART No.
605	2.250	2.625	0.335	0.375	4372200
512	2.250	2.625	0.375	0.413	8823410
513	2.250	2.625	0.375	0.413	8873310
511	2.250	2.750	0.250	0.275	8808610
605	2.250	2.750	0.341	0.375	4331100
512	2.250	2.750	0.375	0.413	8826510
513	2.250	2.750	0.375	0.413	8838710
601	2.250	2.750	0.375	0.413	4128701
605	2.250	2.750	0.375	0.413	4337200
621	2.250	2.750	0.375	0.413	4485210
622	2.250	2.750	0.375	0.413	8906310
512	2.250	2.750	0.563	0.619	8864110
511	2.250	2.875	0.313	0.344	8808710
513	2.250	2.875	0.313	0.344	8816310
513	2.250	2.875	0.500	0.550	8838810
605	2.250	2.875	0.500	0.550	4750200
511	2.250	3.000	0.375	0.413	8869910
513	2.250	3.000	0.375	0.413	8928010
512	2.250	3.000	0.500	0.550	8872910
513	2.250	3.000	0.500	0.550	8875210
605	2.250	3.000	0.511	0.562	4331200
512	2.250	3.000	0.625	0.688	8873010
513	2.250	3.000	0.625	0.688	8842910
511	2.375	2.625	0.125	0.138	8815610
511	2.375	2.750	0.188	0.207	8804010
513	2.375	2.750	0.188	0.207	8928110
513	2.375	2.750	0.280	0.308	8903010
512	2.375	2.750	0.375	0.413	8858410
513	2.375	2.750	0.375	0.413	8861010
605	2.375	2.750	0.375	0.413	4443400
511	2.375	2.875	0.250	0.275	8808810
512	2.375	2.875	0.375	0.413	8826610
513	2.375	2.875	0.375	0.413	8850110
605	2.375	2.875	0.375	0.413	4443500
621	2.375	2.875	0.375	0.413	4485310
513	2.375	2.875	0.563	0.619	8900610
511	2.375	3.000	0.313	0.344	8808910
513	2.375	3.000	0.313	0.344	8827210
601	2.375	3.000	0.312	0.344	4107201
512	2.375	3.000	0.500	0.550	8826710



NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
513	2.375	3.000	0.500	0.550	8838910
513	2.375	3.125	0.625	0.688	8846810
513	2.375	3.375	0.500	0.550	8928210
511	2.500	2.750	0.125	0.138	8800310
513	2.500	2.750	0.125	0.138	8928610
513	2.500	2.750	0.250	0.275	8902210
658	2.500	2.871	0.281	0.311	4576800
511	2.500	2.875	0.188	0.207	8804110
513	2.500	2.875	0.188	0.207	8928410
513	2.500	2.875	0.250	0.275	8908310
605	2.500	2.875	0.312	0.344	4443600
512	2.500	2.875	0.375	0.413	8871010
513	2.500	2.875	0.375	0.413	8836210
605	2.500	2.875	0.375	0.413	4458500
653	2.500	2.924		0.166	4514610
511	2.500	2.937	0.218	0.240	8921410
605	2.500	2.937	0.284	0.312	4535900
511	2.500	3.000	0.203	0.223	8803610
511	2.500	3.000	0.250	0.275	8809010
513	2.500	3.000	0.250	0.275	8928310
605	2.500	3.000	0.250	0.275	4553000
605	2.500	3.000	0.284	0.312	4331300
512	2.500	3.000	0.313	0.344	8821110
513	2.500	3.000	0.313	0.344	8867810
512	2.500	3.000	0.375	0.413	8826810
513	2.500	3.000	0.375	0.413	8839010
601	2.500	3.000	0.375	0.413	4119501
605	2.500	3.000	0.375	0.413	4335900
621	2.500	3.000	0.375	0.413	4485410
622	2.500	3.000	0.375	0.413	8904510
511	2.500	3.125	0.313	0.344	8870110
601	2.500	3.125	0.312	0.344	4124401
513	2.500	3.125	0.375	0.413	8836110
512	2.500	3.125	0.500	0.550	8871810
513	2.500	3.125	0.500	0.550	8873910
605	2.500	3.125	0.500	0.550	4346600
621	2.500	3.125	0.500	0.550	4794310
511	2.500	3.250	0.375	0.413	8815410
513	2.500	3.250	0.375	0.413	8928510
512	2.500	3.250	0.500	0.550	8879210

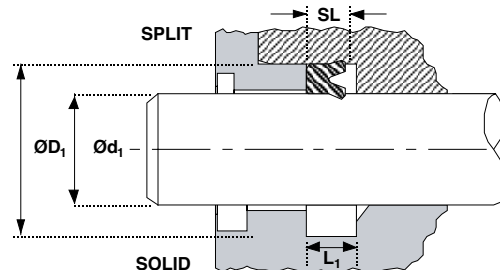
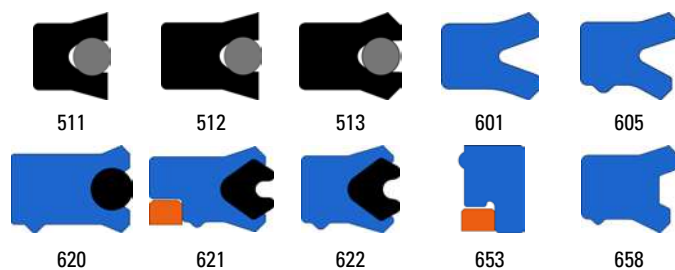
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TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
513	2.500	3.250	0.500	0.550	8875310
512	2.500	3.250	0.625	0.688	8830510
513	2.500	3.250	0.625	0.688	8843010
605	2.500	3.250	0.625	0.688	4347400
511	2.500	3.500	0.500	0.550	8815510
513	2.500	3.500	0.750	0.825	8847110
511	2.563	3.000	0.218	0.240	8921510
511	2.625	3.000	0.188	0.207	8804210
513	2.625	3.000	0.188	0.207	8928710
513	2.625	3.000	0.250	0.275	8868510
512	2.625	3.000	0.313	0.344	8858510
513	2.625	3.000	0.313	0.344	8864310
512	2.625	3.000	0.375	0.413	8823710
513	2.625	3.000	0.375	0.413	8836310
605	2.625	3.000	0.375	0.413	4443700
511	2.625	3.125	0.250	0.275	8809110
513	2.625	3.125	0.375	0.413	8849310
601	2.625	3.125	0.375	0.413	4224701
605	2.625	3.125	0.500	0.550	4514900
511	2.625	3.250	0.313	0.344	8851110
513	2.625	3.250	0.500	0.550	8933310
605	2.625	3.250	0.625	0.688	4376900
513	2.625	3.375	0.625	0.688	8863710
605	2.735	3.250	0.312	0.344	4746400
511	2.750	3.000	0.125	0.138	8817910
511	2.750	3.125	0.188	0.207	8804410
513	2.750	3.125	0.188	0.207	8849910
513	2.750	3.125	0.313	0.344	8846110
512	2.750	3.125	0.375	0.413	8871110
513	2.750	3.125	0.375	0.413	8836410
605	2.750	3.125	0.375	0.413	4379100
653	2.750	3.174		0.166	4533510
511	2.750	3.250	0.250	0.275	8809210
513	2.750	3.250	0.250	0.275	8805910
512	2.750	3.250	0.375	0.413	8826910
513	2.750	3.250	0.375	0.413	8839110
605	2.750	3.250	0.375	0.413	4336000
621	2.750	3.250	0.375	0.413	4485510
622	2.750	3.250	0.375	0.413	8904910
511	2.750	3.375	0.313	0.344	8809310





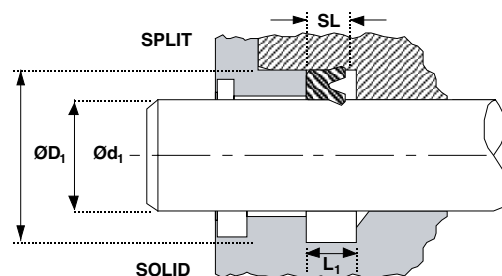
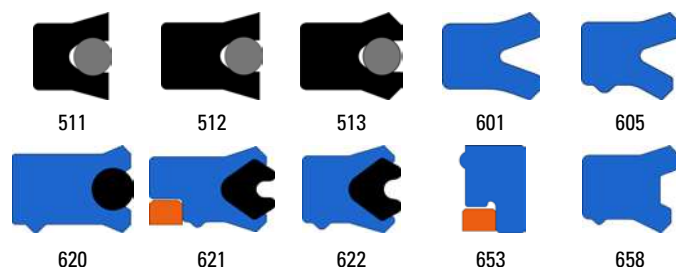
NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
513	2.750	3.375	0.375	0.413	8868910
605	2.750	3.375	0.375	0.413	4456900
512	2.750	3.375	0.500	0.550	8871910
513	2.750	3.375	0.500	0.550	8839210
605	2.750	3.375	0.500	0.550	4346700
601	2.750	3.375	0.562	0.619	4250701
605	2.750	3.375	0.805	0.885	4467400
511	2.750	3.500	0.375	0.413	8815710
512	2.750	3.500	0.500	0.550	8830710
513	2.750	3.500	0.500	0.550	8875410
512	2.750	3.500	0.625	0.688	8830810
513	2.750	3.500	0.625	0.688	8843110
605	2.750	3.500	0.625	0.688	4347500
511	2.750	3.750	0.500	0.550	8900010
511	2.750	4.000	0.625	0.688	8819310
511	2.875	3.125	0.125	0.138	8814210
513	2.875	3.125	0.250	0.275	8847410
511	2.875	3.250	0.188	0.207	8851010
512	2.875	3.250	0.250	0.275	8865610
513	2.875	3.250	0.250	0.275	8861120
513	2.875	3.250	0.280	0.308	8903110
513	2.875	3.250	0.375	0.413	8861110
605	2.875	3.250	0.375	0.413	4443800
511	2.875	3.375	0.250	0.275	8809410
513	2.875	3.375	0.375	0.413	8830910
605	2.875	3.375	0.375	0.413	4760200
511	2.875	3.500	0.313	0.344	8809510
601	2.875	3.500	0.325	0.360	4129701
512	2.875	3.500	0.500	0.550	8872010
513	2.875	3.500	0.500	0.550	8874010
511	3.000	3.250	0.125	0.138	8804510
511	3.000	3.375	0.188	0.207	8804610
513	3.000	3.375	0.188	0.207	8806710
513	3.000	3.375	0.250	0.275	8868210
513	3.000	3.375	0.313	0.344	8861210
512	3.000	3.375	0.375	0.413	8823910
513	3.000	3.375	0.375	0.413	8836510
605	3.000	3.375	0.375	0.413	4468300
605	3.000	3.438	0.281	0.310	4539900
511	3.000	3.500	0.203	0.223	8816110

NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
511	3.000	3.500	0.250	0.275	8809610
513	3.000	3.500	0.250	0.275	8928810
512	3.000	3.500	0.375	0.413	8827010
513	3.000	3.500	0.375	0.413	8839310
601	3.000	3.500	0.375	0.413	4866200
605	3.000	3.500	0.375	0.413	4336100
621	3.000	3.500	0.375	0.413	4485610
622	3.000	3.500	0.375	0.413	8906410
513	3.000	3.500	0.500	0.550	8842110
512	3.000	3.500	0.563	0.619	8850610
513	3.000	3.500	0.563	0.619	8852210
605	3.000	3.500	0.625	0.688	4399600
605	3.000	3.500	0.781	0.859	4476900
653	3.000	3.616		0.247	4515910
511	3.000	3.625	0.313	0.344	8809710
513	3.000	3.625	0.313	0.344	8929010
513	3.000	3.625	0.375	0.413	8828510
512	3.000	3.625	0.500	0.550	8827110
513	3.000	3.625	0.500	0.550	8874110
605	3.000	3.625	0.500	0.550	4346800
621	3.000	3.625	0.500	0.550	4486810
601	3.000	3.625	0.562	0.619	4160001
511	3.000	3.750	0.375	0.413	8815910
513	3.000	3.750	0.375	0.413	8928910
512	3.000	3.750	0.500	0.550	8831010
513	3.000	3.750	0.500	0.550	8875510
512	3.000	3.750	0.625	0.688	8878710
513	3.000	3.750	0.625	0.688	8843210
605	3.000	3.750	0.625	0.688	4347600
621	3.000	3.750	0.625	0.688	4489310
511	3.000	4.000	0.500	0.550	8816010
512	3.000	4.000	0.750	0.825	8850510
513	3.000	4.000	0.750	0.825	8863310
511	3.125	3.500	0.188	0.207	8804710
513	3.125	3.500	0.188	0.207	8908710
512	3.125	3.500	0.250	0.275	8867310
513	3.125	3.500	0.250	0.275	8845110
512	3.125	3.500	0.375	0.413	8871210
513	3.125	3.500	0.375	0.413	8836610
605	3.125	3.500	0.625	0.688	4399700



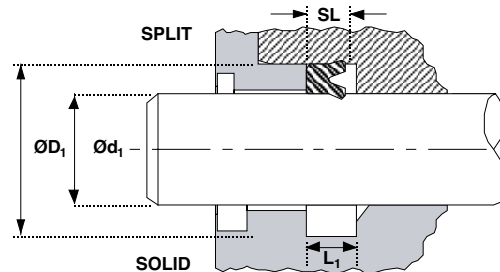
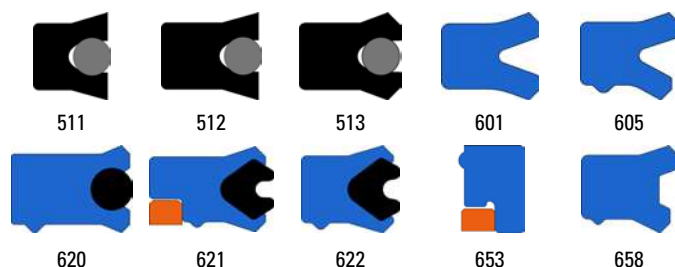
NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
513	3.125	3.625	0.250	0.275	8848510
512	3.125	3.625	0.375	0.413	8859510
513	3.125	3.625	0.375	0.413	8856210
511	3.125	3.750	0.313	0.344	8809910
513	3.125	3.750	0.313	0.344	8929210
513	3.125	3.750	0.500	0.550	8869810
513	3.125	3.875	0.375	0.413	8929110
513	3.125	3.875	0.625	0.688	8900310
512	3.188	3.563	0.375	0.413	8858610
511	3.250	3.500	0.125	0.138	8819610
511	3.250	3.625	0.188	0.207	8804810
512	3.250	3.625	0.313	0.344	8858710
513	3.250	3.625	0.313	0.344	8861310
512	3.250	3.625	0.375	0.413	8824010
513	3.250	3.625	0.375	0.413	8873410
605	3.250	3.625	0.375	0.413	4714100
605	3.250	3.625	0.562	0.619	4476800
511	3.250	3.750	0.250	0.275	8810010
512	3.250	3.750	0.375	0.413	8827310
513	3.250	3.750	0.375	0.413	8839410
605	3.250	3.750	0.375	0.413	4336200
621	3.250	3.750	0.375	0.413	4485710
511	3.250	3.875	0.313	0.344	8879610
513	3.250	3.875	0.313	0.344	8820110
513	3.250	3.875	0.500	0.550	8869710
605	3.250	3.875	0.500	0.550	4415400
511	3.250	4.000	0.375	0.413	8816210
512	3.250	4.000	0.500	0.550	8831110
513	3.250	4.000	0.500	0.550	8875610
512	3.250	4.000	0.625	0.688	8831210
513	3.250	4.000	0.625	0.688	8843310
621	3.250	4.000	0.625	0.688	4790710
511	3.250	4.500	0.625	0.688	8822410
511	3.375	3.750	0.188	0.207	8854210
513	3.375	3.750	0.188	0.207	8932910
513	3.375	3.750	0.250	0.275	8836720
513	3.375	3.750	0.280	0.308	8903210
512	3.375	3.750	0.375	0.413	8858810
513	3.375	3.750	0.375	0.413	8836710
511	3.375	3.875	0.250	0.275	8850710

NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
513	3.375	3.875	0.250	0.275	8929310
513	3.375	3.875	0.375	0.413	8849410
605	3.375	3.875	0.375	0.413	4760300
513	3.375	3.875	0.563	0.619	8900710
511	3.375	4.000	0.313	0.344	8810210
513	3.375	4.000	0.313	0.344	8827410
512	3.375	4.000	0.500	0.550	8872110
513	3.375	4.000	0.500	0.550	8874210
605	3.375	4.000	0.594	0.653	4377000
511	3.375	4.125	0.375	0.413	8857710
512	3.375	4.125	0.625	0.688	8855910
513	3.375	4.125	0.625	0.688	8852110
511	3.375	4.375	0.500	0.550	8866910
511	3.500	3.750	0.125	0.138	8815810
511	3.500	3.875	0.188	0.207	8805010
513	3.500	3.875	0.188	0.207	8929510
512	3.500	3.875	0.375	0.413	8824110
513	3.500	3.875	0.375	0.413	8836810
605	3.500	3.875	0.375	0.413	4468400
511	3.500	4.000	0.203	0.223	8817210
511	3.500	4.000	0.250	0.275	8810310
513	3.500	4.000	0.250	0.275	8929410
512	3.500	4.000	0.313	0.344	8865710
513	3.500	4.000	0.313	0.344	8867910
605	3.500	4.000	0.312	0.344	4540000
512	3.500	4.000	0.375	0.413	8827510
513	3.500	4.000	0.375	0.413	8839510
605	3.500	4.000	0.375	0.413	4336300
621	3.500	4.000	0.375	0.413	4485810
622	3.500	4.000	0.375	0.413	8905010
653	3.500	4.116		0.247	4514810
511	3.500	4.125	0.313	0.344	8810410
513	3.500	4.125	0.375	0.413	8837410
512	3.500	4.125	0.500	0.550	8827710
513	3.500	4.125	0.500	0.550	8874310
605	3.500	4.125	0.500	0.550	4346900
621	3.500	4.125	0.500	0.550	4486910
511	3.500	4.250	0.375	0.413	8816410
512	3.500	4.250	0.500	0.550	8878810
513	3.500	4.250	0.500	0.550	8875710



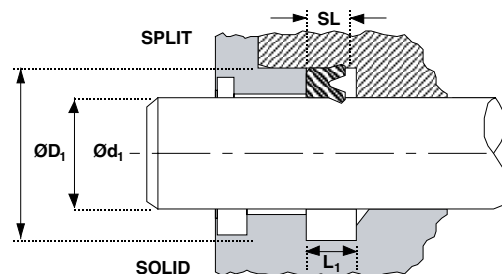
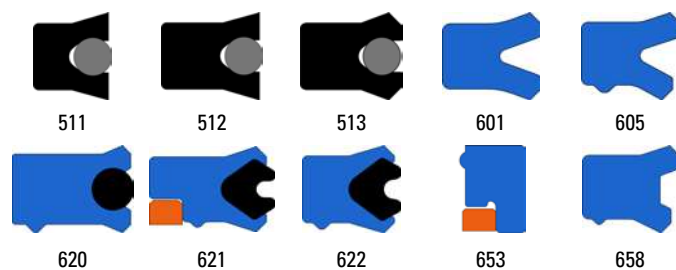
NOMINAL					
TYPE	ϕd_1	ϕD_1	SL	L_1	PART No.
512	3.500	4.250	0.625	0.688	8831310
513	3.500	4.250	0.625	0.688	8843410
605	3.500	4.250	0.625	0.688	4347700
621	3.500	4.250	0.625	0.688	4573610
512	3.500	4.500	0.625	0.688	8907810
512	3.500	4.500	0.750	0.825	8823010
513	3.500	5.000	0.750	0.825	8929610
511	3.550	4.175	0.250	0.275	8899510
511	3.625	4.000	0.188	0.207	8805110
513	3.625	4.000	0.188	0.207	8929710
513	3.625	4.000	0.250	0.275	8868610
512	3.625	4.000	0.313	0.344	8864010
513	3.625	4.000	0.313	0.344	8864410
512	3.625	4.000	0.375	0.413	8824210
513	3.625	4.000	0.375	0.413	8836910
511	3.625	4.125	0.250	0.275	8810510
513	3.625	4.125	0.375	0.413	8849510
605	3.625	4.125	0.375	0.413	4436200
511	3.625	4.250	0.313	0.344	8851210
513	3.625	4.250	0.375	0.413	8933910
511	3.625	4.375	0.375	0.413	8824610
513	3.625	4.375	0.625	0.688	8865310
511	3.750	4.000	0.125	0.138	8818710
511	3.750	4.125	0.188	0.207	8879410
513	3.750	4.125	0.188	0.207	8850210
513	3.750	4.125	0.313	0.344	8846210
512	3.750	4.125	0.375	0.413	8855010
513	3.750	4.125	0.375	0.413	8837010
605	3.750	4.125	0.375	0.413	4702500
621	3.750	4.125	0.375	0.413	4709310
511	3.750	4.250	0.250	0.275	8810610
513	3.750	4.250	0.250	0.275	8848610
512	3.750	4.250	0.375	0.413	8827810
513	3.750	4.250	0.375	0.413	8839710
605	3.750	4.250	0.375	0.413	4443900
621	3.750	4.250	0.375	0.413	4790810
605	3.750	4.250	0.500	0.550	4456500
513	3.750	4.250	0.563	0.619	8839810
605	3.750	4.250	0.562	0.625	4436100
511	3.750	4.375	0.313	0.344	8870210

NOMINAL					
TYPE	ϕd_1	ϕD_1	SL	L_1	PART No.
513	3.750	4.375	0.375	0.413	8869010
512	3.750	4.375	0.500	0.550	8872210
513	3.750	4.375	0.500	0.550	8874410
511	3.750	4.500	0.375	0.413	8816610
513	3.750	4.500	0.375	0.413	8929810
601	3.750	4.500	0.375	0.413	4119201
512	3.750	4.500	0.500	0.550	8831410
513	3.750	4.500	0.500	0.550	8875810
513	3.750	4.500	0.625	0.688	8875910
511	3.875	4.125	0.125	0.138	8816510
513	3.875	4.125	0.250	0.275	8845510
511	3.875	4.250	0.188	0.207	8823510
512	3.875	4.250	0.250	0.275	8820910
513	3.875	4.250	0.250	0.275	8861420
513	3.875	4.250	0.280	0.308	8903310
513	3.875	4.250	0.375	0.413	8861410
511	3.875	4.375	0.250	0.275	8810710
513	3.875	4.375	0.375	0.413	8832510
605	3.875	4.375	0.375	0.413	4760400
511	3.875	4.500	0.313	0.344	8870310
512	3.875	4.500	0.500	0.550	8872310
513	3.875	4.500	0.500	0.550	8839910
511	3.875	4.625	0.375	0.413	8819210
511	4.000	4.250	0.125	0.138	8805210
513	4.000	4.250	0.125	0.138	8930010
511	4.000	4.375	0.188	0.207	8805310
513	4.000	4.375	0.188	0.207	8820010
513	4.000	4.375	0.250	0.275	8868310
513	4.000	4.375	0.313	0.344	8861510
512	4.000	4.375	0.375	0.413	8824310
513	4.000	4.375	0.375	0.413	8837110
605	4.000	4.375	0.375	0.413	4468500
511	4.000	4.500	0.250	0.275	8810810
513	4.000	4.500	0.250	0.275	8929910
605	4.000	4.500	0.312	0.344	4586700
512	4.000	4.500	0.375	0.413	8827910
513	4.000	4.500	0.375	0.413	8840010
605	4.000	4.500	0.375	0.413	4336400
621	4.000	4.500	0.375	0.413	4486010
622	4.000	4.500	0.375	0.413	8906510



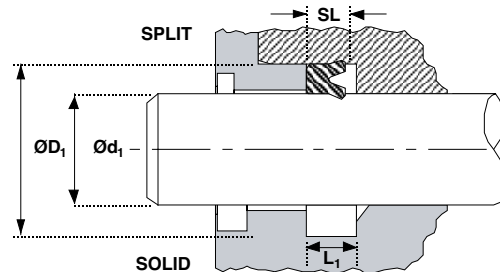
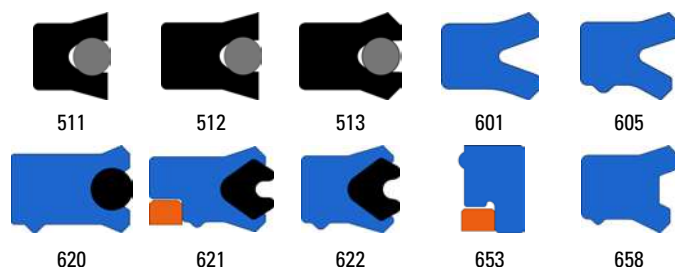
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TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
513	4.000	4.500	0.500	0.550	8867510
601	4.000	4.500	0.511	0.562	4373400
512	4.000	4.500	0.563	0.619	8828010
513	4.000	4.500	0.563	0.619	8840110
605	4.000	4.500	0.562	0.619	4385700
621	4.000	4.500	0.562	0.619	4486110
605	4.000	4.500	0.781	0.859	4399800
653	4.000	4.616		0.247	4524610
511	4.000	4.625	0.313	0.344	8810910
605	4.000	4.625	0.375	0.413	4520100
621	4.000	4.625	0.375	0.413	4778610
513	4.000	4.625	0.500	0.550	8874510
605	4.000	4.625	0.500	0.550	4347000
621	4.000	4.625	0.500	0.550	4792610
513	4.000	4.625	0.563	0.619	8862310
621	4.000	4.625	0.562	0.619	4487010
511	4.000	4.750	0.375	0.413	8816810
601	4.000	4.750	0.375	0.413	4120501
512	4.000	4.750	0.500	0.550	8878910
513	4.000	4.750	0.500	0.550	8876010
605	4.000	4.750	0.500	0.550	4444000
601	4.000	4.750	0.536	0.600	4422500
512	4.000	4.750	0.625	0.688	8831610
513	4.000	4.750	0.625	0.688	8843510
605	4.000	4.750	0.625	0.688	4347800
621	4.000	4.750	0.625	0.688	4483310
511	4.000	5.000	0.500	0.550	8816910
513	4.000	5.000	0.500	0.550	8930110
512	4.000	5.000	0.750	0.825	8853510
513	4.000	5.000	0.750	0.825	8877410
511	4.125	4.500	0.188	0.207	8805410
513	4.125	4.500	0.250	0.275	8845210
512	4.125	4.500	0.313	0.344	8867210
512	4.125	4.500	0.375	0.413	8871310
513	4.125	4.500	0.375	0.413	8837210
513	4.125	4.625	0.250	0.275	8806010
512	4.125	4.625	0.375	0.413	8859610
513	4.125	4.625	0.375	0.413	8856410
511	4.125	4.750	0.313	0.344	8811110
513	4.125	4.750	0.500	0.550	8869610

NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
513	4.125	4.750	0.625	0.688	8869510
511	4.125	4.875	0.375	0.413	8853210
512	4.188	4.563	0.375	0.413	8859010
511	4.250	4.500	0.125	0.138	8819710
511	4.250	4.625	0.188	0.207	8805510
512	4.250	4.625	0.313	0.344	8859110
513	4.250	4.625	0.313	0.344	8861610
512	4.250	4.625	0.375	0.413	8824410
513	4.250	4.625	0.375	0.413	8837310
511	4.250	4.750	0.250	0.275	8811210
513	4.250	4.750	0.250	0.275	8930310
512	4.250	4.750	0.375	0.413	8828210
513	4.250	4.750	0.375	0.413	8840210
512	4.250	4.750	0.563	0.619	8833710
513	4.250	4.750	0.563	0.619	8905810
511	4.250	4.875	0.313	0.344	8811310
513	4.250	4.875	0.313	0.344	8821610
513	4.250	4.875	0.500	0.550	8869410
513	4.250	4.875	0.563	0.619	8930210
511	4.250	5.000	0.375	0.413	8817010
513	4.250	5.000	0.375	0.413	8867410
512	4.250	5.000	0.500	0.550	8831810
513	4.250	5.000	0.500	0.550	8876110
512	4.250	5.000	0.625	0.688	8831910
513	4.250	5.000	0.625	0.688	8843610
605	4.250	5.000	0.625	0.688	4347900
621	4.250	5.000	0.625	0.688	4790910
511	4.250	5.250	0.500	0.550	8858910
513	4.250	5.250	0.750	0.825	8847210
511	4.250	5.500	0.625	0.688	8819810
511	4.375	4.750	0.188	0.207	8854310
513	4.375	4.750	0.280	0.308	8903410
512	4.375	4.750	0.375	0.413	8859210
513	4.375	4.750	0.375	0.413	8861710
511	4.375	4.875	0.250	0.275	8811410
513	4.375	4.875	0.250	0.275	8848310
605	4.375	4.875	0.375	0.413	4760500
513	4.375	4.875	0.563	0.619	8900510
511	4.375	5.000	0.313	0.344	8811510
513	4.375	5.000	0.313	0.344	8827610



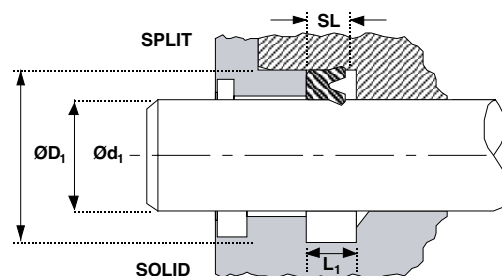
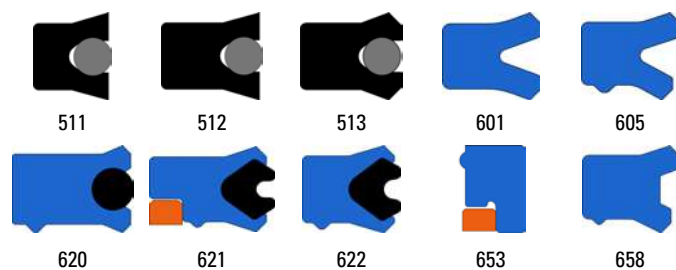
NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
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513	4.375	5.000	0.500	0.550	8874610
512	4.375	5.000	0.563	0.619	8922410
512	4.375	5.000	0.625	0.688	8872410
513	4.375	5.000	0.625	0.688	8840410
511	4.500	4.875	0.188	0.207	8805710
512	4.500	4.875	0.375	0.413	8824510
513	4.500	4.875	0.375	0.413	8837510
511	4.500	5.000	0.203	0.223	8804310
511	4.500	5.000	0.250	0.275	8811610
513	4.500	5.000	0.250	0.275	8817110
512	4.500	5.000	0.313	0.344	8821410
513	4.500	5.000	0.313	0.344	8868010
512	4.500	5.000	0.375	0.413	8828610
513	4.500	5.000	0.375	0.413	8840510
601	4.500	5.000	0.375	0.413	4129801
605	4.500	5.000	0.375	0.413	4379200
621	4.500	5.000	0.375	0.413	4486210
622	4.500	5.000	0.375	0.413	8906610
513	4.500	5.000	0.500	0.550	8864710
512	4.500	5.000	0.563	0.619	8828710
513	4.500	5.000	0.563	0.619	8840610
621	4.500	5.000	0.562	0.619	4486310
511	4.500	5.125	0.313	0.344	8811710
513	4.500	5.125	0.375	0.413	8840710
621	4.500	5.125	0.375	0.413	4791010
605	4.500	5.125	0.500	0.550	4347100
512	4.500	5.125	0.625	0.688	8872510
513	4.500	5.125	0.625	0.688	8840810
605	4.500	5.125	0.625	0.688	4444100
621	4.500	5.125	0.625	0.688	4486410
511	4.500	5.250	0.375	0.413	8817310
513	4.500	5.250	0.375	0.413	8930410
512	4.500	5.250	0.500	0.550	8832010
513	4.500	5.250	0.500	0.550	8876210
512	4.500	5.250	0.625	0.688	8832110
513	4.500	5.250	0.625	0.688	8843710
605	4.500	5.250	0.625	0.688	4348000
621	4.500	5.250	0.625	0.688	4483410
511	4.500	5.500	0.500	0.550	8817410

NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
513	4.500	5.500	0.500	0.550	8930510
513	4.500	5.500	0.750	0.825	8847310
511	4.625	5.000	0.188	0.207	8879510
513	4.625	5.000	0.250	0.275	8868710
512	4.625	5.000	0.313	0.344	8859310
513	4.625	5.000	0.313	0.344	8864510
512	4.625	5.000	0.375	0.413	8855410
513	4.625	5.000	0.375	0.413	8837610
511	4.625	5.125	0.250	0.275	8811810
513	4.625	5.125	0.250	0.275	8848410
605	4.625	5.250	0.625	0.688	4377100
511	4.750	5.000	0.125	0.138	8818110
513	4.750	5.125	0.375	0.413	8846610
605	4.750	5.125	0.375	0.413	4714200
511	4.750	5.250	0.250	0.275	8811910
513	4.750	5.250	0.250	0.275	8930810
513	4.750	5.250	0.375	0.413	8861910
513	4.750	5.250	0.500	0.550	8846310
512	4.750	5.250	0.563	0.619	8933410
513	4.750	5.250	0.563	0.619	8840910
605	4.750	5.250	0.625	0.688	4451100
511	4.750	5.375	0.313	0.344	8879710
513	4.750	5.375	0.500	0.550	8869310
513	4.750	5.375	0.625	0.688	8862410
511	4.750	5.500	0.375	0.413	8817510
513	4.750	5.500	0.375	0.413	8930610
621	4.750	5.500	0.375	0.413	4791210
601	4.750	5.500	0.360	0.437	4154701
513	4.750	5.500	0.500	0.550	8876310
512	4.750	5.500	0.625	0.688	8832210
513	4.750	5.500	0.625	0.688	8876410
621	4.750	5.500	0.625	0.688	4791110
513	4.750	5.750	0.750	0.825	8930710
511	4.750	6.000	0.625	0.688	8819410
511	4.875	5.125	0.125	0.138	8816710
513	4.875	5.125	0.250	0.275	8845610
511	4.875	5.250	0.188	0.207	8823610
512	4.875	5.250	0.250	0.275	8821510
513	4.875	5.250	0.280	0.308	8903510
513	4.875	5.250	0.375	0.413	8861810



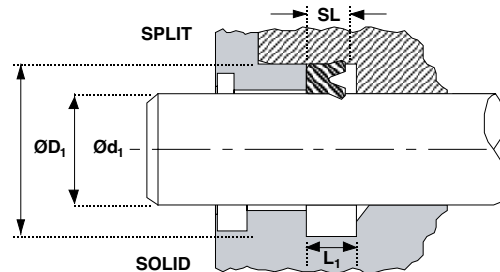
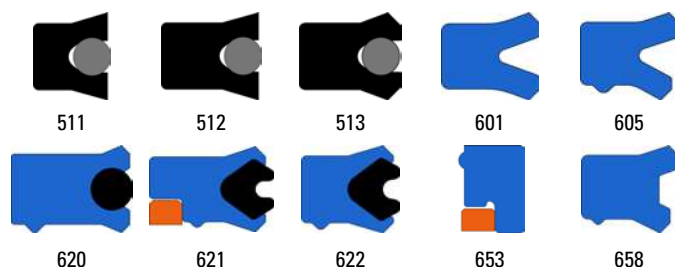
NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
511	4.875	5.375	0.250	0.275	8856510
513	4.875	5.375	0.375	0.413	8832910
605	4.875	5.375	0.375	0.413	4760600
513	4.875	5.375	0.563	0.619	8930910
511	4.875	5.500	0.313	0.343	8921610
513	5.000	5.375	0.375	0.413	8842510
511	5.000	5.500	0.250	0.275	8812010
513	5.000	5.500	0.250	0.275	8931210
512	5.000	5.500	0.375	0.413	8871510
513	5.000	5.500	0.375	0.413	8841010
605	5.000	5.500	0.375	0.413	4495000
513	5.000	5.500	0.500	0.550	8866810
512	5.000	5.500	0.563	0.619	8828810
513	5.000	5.500	0.563	0.619	8841110
605	5.000	5.500	0.562	0.619	4386100
621	5.000	5.500	0.562	0.619	4486510
605	5.000	5.500	0.781	0.859	4399900
605	5.000	5.531	0.557	0.619	4391400
511	5.000	5.625	0.313	0.344	8812110
605	5.000	5.625	0.500	0.550	4347200
513	5.000	5.625	0.625	0.688	8874710
621	5.000	5.625	0.625	0.688	4487110
511	5.000	5.750	0.375	0.413	8817610
513	5.000	5.750	0.375	0.413	8931010
601	5.000	5.750	0.482	0.539	4224801
512	5.000	5.750	0.500	0.550	8879110
513	5.000	5.750	0.500	0.550	8876510
512	5.000	5.750	0.625	0.688	8832310
513	5.000	5.750	0.625	0.688	8843810
605	5.000	5.750	0.625	0.688	4348100
621	5.000	5.750	0.625	0.688	4483510
511	5.000	6.000	0.500	0.550	8817710
512	5.000	6.000	0.750	0.825	8832410
513	5.000	6.000	0.750	0.825	8907610
513	5.000	6.000	0.750	0.825	8931110
601	5.000	6.000	0.750	0.825	8901300
511	5.125	5.500	0.188	0.207	8908510
605	5.125	5.625	0.562	0.619	4436000
605	5.125	6.000	0.500	0.550	4444200
511	5.125	6.125	0.500	0.550	8851810

NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
511	5.250	5.750	0.250	0.275	8812210
513	5.250	5.750	0.563	0.619	8862010
511	5.250	5.875	0.313	0.344	8856910
513	5.250	5.875	0.625	0.688	8862510
511	5.250	6.000	0.375	0.413	8817810
513	5.250	6.000	0.375	0.413	8931310
512	5.250	6.000	0.500	0.550	8905910
513	5.250	6.000	0.500	0.550	8865010
512	5.250	6.000	0.625	0.688	8832610
513	5.250	6.000	0.625	0.688	8843910
621	5.250	6.000	0.625	0.688	4791310
513	5.250	6.000	0.750	0.825	8854410
511	5.250	6.250	0.500	0.550	8900110
513	5.250	6.250	0.500	0.550	8931410
513	5.250	6.250	0.750	0.825	8847510
605	5.375	5.875	0.625	0.688	4475800
511	5.375	6.000	0.313	0.344	8812310
513	5.375	6.000	0.313	0.344	8931510
513	5.375	6.000	0.375	0.413	8931610
512	5.375	6.000	0.625	0.688	8872610
513	5.375	6.000	0.625	0.688	8841210
605	5.375	6.000	0.625	0.688	4448300
511	5.375	6.375	0.500	0.550	8863610
511	5.437	6.000	0.281	0.310	8921710
513	5.500	5.875	0.375	0.413	8905710
511	5.500	6.000	0.250	0.275	8812410
512	5.500	6.000	0.375	0.413	8829110
513	5.500	6.000	0.375	0.413	8841310
605	5.500	6.000	0.375	0.413	4379300
512	5.500	6.000	0.500	0.550	8922510
513	5.500	6.000	0.500	0.550	8833610
512	5.500	6.000	0.563	0.619	8829210
513	5.500	6.000	0.563	0.619	8841410
605	5.500	6.000	0.562	0.619	4468600
621	5.500	6.000	0.562	0.619	4486610
511	5.500	6.125	0.313	0.344	8812510
513	5.500	6.125	0.313	0.344	8931810
605	5.500	6.125	0.312	0.344	4540100
621	5.500	6.125	0.375	0.413	4791410
513	5.500	6.125	0.625	0.688	8933810



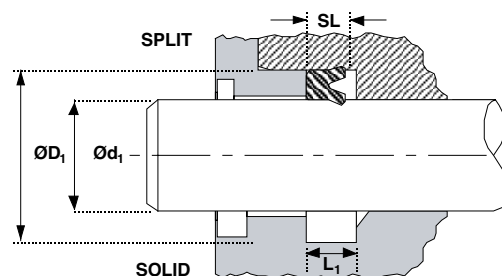
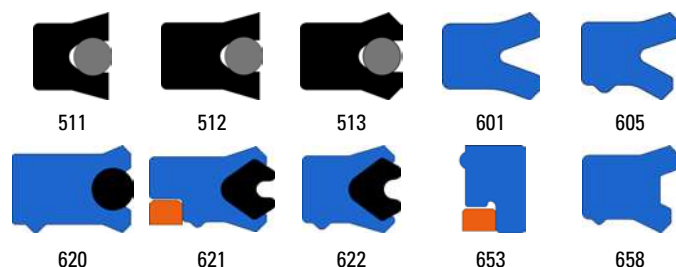
NOMINAL					
TYPE	Ød ₁	ØD ₁	SL	L ₁	PART No.
511	5.500	6.250	0.375	0.413	8818010
513	5.500	6.250	0.375	0.413	8931710
601	5.500	6.250	0.375	0.413	4119301
513	5.500	6.250	0.500	0.550	8863010
513	5.500	6.250	0.625	0.688	8844010
605	5.500	6.250	0.625	0.688	4348200
512	5.500	6.500	0.750	0.825	8823310
605	5.625	6.125	0.375	0.413	4714300
513	5.625	6.125	0.563	0.619	8903610
511	5.625	6.375	0.375	0.413	8814110
511	5.750	6.250	0.250	0.275	8812610
513	5.750	6.250	0.375	0.413	8866410
512	5.750	6.250	0.563	0.619	8905510
513	5.750	6.250	0.563	0.619	8841610
511	5.750	6.375	0.313	0.344	8857010
511	5.750	6.500	0.375	0.413	8818210
601	5.750	6.500	0.375	0.413	4135301
512	5.750	6.500	0.500	0.550	8829010
513	5.750	6.500	0.500	0.550	8866110
512	5.750	6.500	0.625	0.688	8832810
513	5.750	6.500	0.625	0.688	8878010
621	5.750	6.500	0.625	0.688	4791510
513	5.875	6.625	0.625	0.688	8900410
511	6.000	6.500	0.250	0.275	8812810
513	6.000	6.500	0.375	0.413	8852310
513	6.000	6.500	0.500	0.550	8867610
512	6.000	6.500	0.563	0.619	8829310
513	6.000	6.500	0.563	0.619	8841710
605	6.000	6.500	0.562	0.619	4436500
621	6.000	6.500	0.562	0.619	4486710
605	6.000	6.500	0.781	0.859	4400000
605	6.000	6.531	0.562	0.619	4391000
511	6.000	6.625	0.313	0.344	8812910
513	6.000	6.625	0.625	0.688	8862610
511	6.000	6.750	0.375	0.413	8818310
513	6.000	6.750	0.375	0.413	8931910
513	6.000	6.750	0.500	0.550	8866210
512	6.000	6.750	0.625	0.688	8833010
513	6.000	6.750	0.625	0.688	8844110
605	6.000	6.750	0.625	0.688	4348300

NOMINAL					
TYPE	Ød ₁	ØD ₁	SL	L ₁	PART No.
621	6.000	6.750	0.625	0.688	4487210
511	6.000	7.000	0.500	0.550	8818410
512	6.000	7.000	0.750	0.825	8833110
513	6.000	7.000	0.750	0.825	8863410
513	6.000	7.000	0.750	0.825	8932010
511	6.250	6.750	0.250	0.275	8856610
513	6.250	6.750	0.563	0.619	8905610
511	6.250	6.875	0.313	0.344	8857110
511	6.250	7.000	0.375	0.413	8818510
512	6.250	7.000	0.500	0.550	8833210
513	6.250	7.000	0.500	0.550	8902410
512	6.250	7.000	0.625	0.688	8833310
513	6.250	7.000	0.625	0.688	8844210
621	6.250	7.000	0.625	0.688	4791610
511	6.250	7.250	0.500	0.550	8857810
513	6.250	7.250	0.750	0.825	8847710
511	6.375	7.000	0.313	0.344	8813010
512	6.375	7.000	0.625	0.688	8829410
513	6.375	7.000	0.625	0.688	8841810
511	6.500	7.000	0.250	0.275	8813110
513	6.500	7.000	0.250	0.275	8899410
512	6.500	7.000	0.375	0.413	8829510
513	6.500	7.000	0.375	0.413	8852610
513	6.500	7.000	0.500	0.550	8846410
512	6.500	7.000	0.563	0.619	8829710
513	6.500	7.000	0.563	0.619	8841910
511	6.500	7.125	0.313	0.344	8876610
513	6.500	7.125	0.625	0.688	8869110
511	6.500	7.250	0.375	0.413	8818610
513	6.500	7.250	0.375	0.413	8932110
513	6.500	7.250	0.500	0.550	8853310
621	6.500	7.250	0.500	0.550	4791710
512	6.500	7.250	0.625	0.688	8833410
513	6.500	7.250	0.625	0.688	8844310
605	6.500	7.250	0.625	0.688	4348400
511	6.500	7.500	0.500	0.550	8815210
511	6.500	7.750	0.625	0.688	8819910
511	6.750	7.250	0.250	0.275	8813210
513	6.750	7.250	0.375	0.413	8865910
513	6.750	7.250	0.500	0.550	8866010



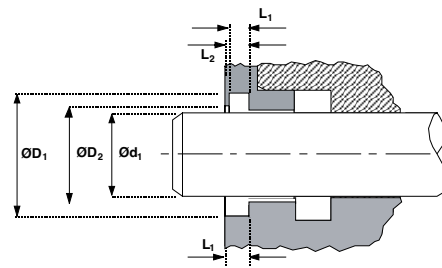
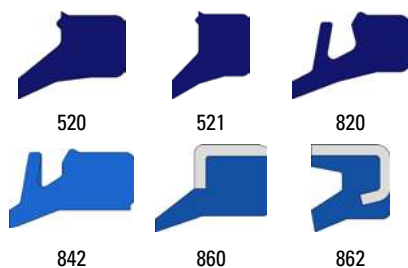
NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
513	6.750	7.250	0.563	0.619	8866310
621	6.750	7.250	0.562	0.619	4791810
511	6.750	7.375	0.313	0.344	8857210
513	6.750	7.375	0.625	0.688	8862710
511	6.750	7.500	0.375	0.413	8818810
513	6.750	7.500	0.375	0.413	8932210
513	6.750	7.500	0.500	0.550	8854610
512	6.750	7.500	0.625	0.688	8850810
513	6.750	7.500	0.625	0.688	8854710
511	6.750	8.000	0.625	0.688	8819510
511	7.000	7.500	0.250	0.275	8813310
601	7.000	7.500	0.250	0.275	4806200
512	7.000	7.500	0.375	0.413	8822610
513	7.000	7.500	0.375	0.413	8852410
513	7.000	7.500	0.500	0.550	8842410
621	7.000	7.500	0.500	0.550	4791910
512	7.000	7.500	0.563	0.619	8877210
513	7.000	7.500	0.563	0.619	8877910
605	7.000	7.500	0.562	0.619	4436600
605	7.000	7.500	0.780	0.859	4456600
605	7.000	7.531	0.562	0.619	4391100
653	7.000	7.616		0.247	4588310
511	7.000	7.625	0.313	0.344	8879310
621	7.000	7.625	0.562	0.619	4792310
512	7.000	7.625	0.625	0.688	8859710
513	7.000	7.625	0.625	0.688	8854810
511	7.000	7.750	0.375	0.413	8877010
512	7.000	7.750	0.500	0.550	8859810
513	7.000	7.750	0.500	0.550	8854010
621	7.000	7.750	0.562	0.619	4792710
512	7.000	7.750	0.625	0.688	8877610
513	7.000	7.750	0.625	0.688	8844410
605	7.000	7.750	0.625	0.688	4348500
621	7.000	7.750	0.625	0.688	4588210
511	7.000	8.000	0.500	0.550	8851310
512	7.000	8.000	0.750	0.825	8851910
513	7.000	8.000	0.750	0.825	8870410
511	7.250	7.750	0.250	0.275	8856710
513	7.250	7.750	0.563	0.619	8862110
511	7.250	7.875	0.313	0.344	8857310

NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
513	7.250	7.875	0.625	0.688	8862810
511	7.250	8.000	0.375	0.413	8818910
513	7.250	8.000	0.375	0.413	8932310
513	7.250	8.000	0.500	0.550	8865110
512	7.250	8.000	0.625	0.688	8833510
513	7.250	8.000	0.625	0.688	8844510
513	7.250	8.000	0.750	0.825	8854510
511	7.250	8.250	0.500	0.550	8857910
513	7.250	8.250	0.750	0.825	8847810
511	7.375	8.000	0.313	0.344	8876710
513	7.375	8.000	0.500	0.550	8842610
512	7.375	8.000	0.625	0.688	8855310
513	7.375	8.000	0.625	0.688	8864910
511	7.375	8.375	0.500	0.550	8863910
511	7.500	8.000	0.250	0.275	8813410
513	7.500	8.000	0.250	0.275	8932410
512	7.500	8.000	0.375	0.413	8829610
513	7.500	8.000	0.375	0.413	8852510
605	7.500	8.000	0.375	0.413	4714400
513	7.500	8.000	0.500	0.550	8833810
512	7.500	8.000	0.563	0.619	8877310
513	7.500	8.000	0.563	0.619	8852810
511	7.500	8.125	0.313	0.344	8813510
511	7.500	8.250	0.375	0.413	8877110
513	7.500	8.250	0.500	0.550	8863210
513	7.500	8.250	0.625	0.688	8878110
511	7.500	8.500	0.500	0.550	8851610
512	7.500	8.500	0.750	0.825	8820410
511	7.625	8.375	0.375	0.413	8814010
511	7.750	8.250	0.250	0.275	8921810
511	7.750	8.375	0.313	0.344	8857410
511	7.750	8.500	0.375	0.413	8853910
513	7.750	8.500	0.500	0.550	8865210
512	7.750	8.500	0.625	0.688	8859910
513	7.750	8.500	0.625	0.688	8853610
605	7.750	8.500	0.625	0.688	4353900
601	7.750	8.750	0.500	0.550	4806100
513	7.750	8.750	0.750	0.825	8847910
511	8.000	8.500	0.250	0.275	8813610
513	8.000	8.500	0.250	0.275	8904610



NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
513	8.000	8.500	0.375	0.413	8848210
605	8.000	8.500	0.375	0.413	4733400
513	8.000	8.500	0.563	0.619	8842310
605	8.000	8.500	0.562	0.619	4468700
621	8.000	8.500	0.562	0.619	4792110
653	8.000	8.610		0.247	4753410
511	8.000	8.625	0.313	0.344	8876910
513	8.000	8.625	0.500	0.550	8866610
513	8.000	8.625	0.625	0.688	8904810
511	8.000	8.750	0.375	0.413	8869210
513	8.000	8.750	0.625	0.688	8878210
605	8.000	8.750	0.625	0.688	4510500
621	8.000	8.750	0.625	0.688	4573210
511	8.000	9.000	0.500	0.550	8819010
512	8.000	9.000	0.750	0.825	8855210
513	8.000	9.000	0.750	0.825	8863510
605	8.125	8.625	0.781	0.859	4477000
511	8.125	9.125	0.500	0.550	8853810
511	8.250	8.750	0.250	0.275	8856810
511	8.250	8.875	0.313	0.344	8857510
511	8.250	9.000	0.375	0.413	8851410
512	8.250	9.000	0.500	0.550	8860010
512	8.250	9.000	0.625	0.688	8853710
513	8.250	9.000	0.625	0.688	8854110
512	8.250	9.250	0.750	0.825	8904710
511	8.500	9.000	0.250	0.275	8813710
512	8.500	9.000	0.375	0.413	8829810
513	8.500	9.000	0.375	0.413	8852710
605	8.500	9.000	0.375	0.413	4733500
513	8.500	9.000	0.500	0.550	8833910
512	8.500	9.000	0.563	0.619	8855110
513	8.500	9.000	0.563	0.619	8853010
653	8.500	9.116		0.247	4744810
511	8.500	9.125	0.313	0.344	8857610
513	8.500	9.125	0.625	0.688	8862910
621	8.500	9.250	0.625	0.688	4745010
511	8.750	9.500	0.375	0.413	8921910
513	8.750	9.500	0.500	0.550	8934810
605	9.000	9.500	0.562	0.619	4468800
513	9.000	9.750	0.375	0.413	8932510

NOMINAL					
TYPE	$\varnothing d_1$	$\varnothing D_1$	SL	L_1	PART No.
621	9.000	9.750	0.625	0.688	4808810
511	9.000	10.000	0.500	0.550	8905410
512	9.000	10.000	0.750	0.825	8922610
621	9.000	10.000	0.750	0.825	4809810
605	9.250	10.000	0.625	0.688	4499300
605	9.375	9.875	0.781	0.859	4477100
513	9.500	10.000	0.563	0.619	8932610
513	9.500	10.250	0.625	0.688	8933710
605	9.750	10.250	0.375	0.413	4733600
513	10.000	10.500	0.563	0.619	8932710
605	10.000	10.500	0.562	0.619	4468900
621	10.000	10.500	0.562	0.619	4792210
511	10.000	10.750	0.375	0.413	8922010
621	10.000	10.750	0.625	0.688	4808910
512	10.000	11.000	0.750	0.825	8922710
621	10.000	11.000	0.750	0.825	4809410
513	10.250	11.000	0.500	0.550	8934710
621	10.500	11.125	0.562	0.619	4792410
511	11.000	11.750	0.375	0.413	8922110
621	11.000	11.750	0.625	0.688	4809210
512	11.000	12.000	0.750	0.825	8922810
511	11.500	12.000	0.250	0.275	8922210
621	12.000	12.750	0.625	0.688	4809310
653	12.000	12.950		0.319	4764910
621	12.000	13.000	0.750	0.825	4809510
621	13.000	13.625	0.562	0.619	4792510
621	14.000	15.000	0.750	0.825	4809610
621	15.000	16.000	0.750	0.825	4809710

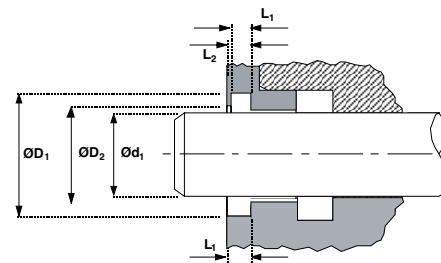
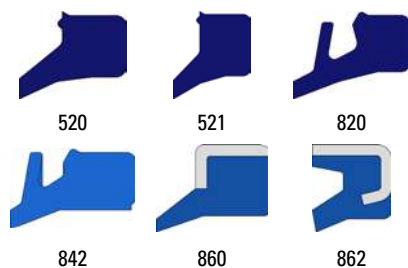


NOMINAL							
TYPE	ϕd_1	ϕD_1	ϕD_2	L_1	L_2	WL	PART No.
520	0.375	0.625	0.540	0.125	0.187		8889010
520	0.500	0.750	0.665	0.125	0.187		8880210
521	0.500	0.760	0.647	0.107	0.187		8883510
521	0.563	0.822	0.710	0.107	0.187		8896300
520	0.563	0.844	0.736	0.125	0.187		8888910
520	0.625	0.875	0.790	0.125	0.187		8880310
521	0.625	0.885	0.772	0.107	0.187		8883610
862	0.625	1.125		0.313			6960000
521	0.687	0.947	0.834	0.107	0.187		8896400
521	0.750	1.010	0.897	0.107	0.187		8883710
520	0.750	1.125	1.000	0.187	0.281		8880410
860	0.750	1.125		0.187		0.297	6955100
862	0.750	1.250		0.313			6960010
521	0.812	1.084	0.960	0.107	0.187		8896500
521	0.875	1.147	1.023	0.107	0.187		8883810
520	0.875	1.250	1.125	0.187	0.281		8880510
521	0.937	1.209	1.085	0.107	0.187		8896600
521	1.000	1.272	1.148	0.107	0.187		8883910
520	1.000	1.375	1.250	0.187	0.281		8880610
860	1.000	1.375		0.187		0.297	6955120
862	1.000	1.500		0.313			6960020
521	1.125	1.397	1.273	0.107	0.187		8884010
520	1.125	1.500	1.375	0.187	0.281		8880710
820	1.125	1.500	1.375	0.187		0.350	4855600
862	1.125	1.625		0.313			6960030
521	1.187	1.459	1.335	0.107	0.187		8896700
520	1.187	1.562	1.437	0.187	0.281		8880810
521	1.250	1.522	1.398	0.107	0.187		8884110
520	1.250	1.625	1.500	0.187	0.281		8880910
820	1.250	1.625	1.500	0.187		0.350	4855700
860	1.250	1.625		0.187		0.297	6955140
862	1.250	1.750		0.250			6960260
862	1.250	1.750		0.313			6960040
521	1.312	1.614	1.480	0.107	0.187		8884200
521	1.375	1.677	1.542	0.107	0.187		8884310
520	1.375	1.750	1.625	0.187	0.281		8881110
820	1.375	1.750	1.625	0.187		0.350	4855800

NOTE WL refers to wiper length.

NOMINAL							
TYPE	ϕd_1	ϕD_1	ϕD_2	L_1	L_2	WL	PART No.
862	1.375	1.875		0.313			6960050
521	1.500	1.802	1.668	0.107	0.187		8884410
520	1.500	1.875	1.750	0.187	0.281		8881210
820	1.500	1.875	1.750	0.187		0.350	4855900
860	1.500	1.875		0.187		0.297	6955160
862	1.500	2.000		0.250			6960270
862	1.500	2.000		0.313			6960060
521	1.625	1.927	1.793	0.107	0.187		8884500
520	1.625	2.000	1.875	0.187	0.281		8881310
862	1.625	2.125		0.313			6960070
521	1.750	2.052	1.918	0.107	0.187		8884610
520	1.750	2.125	2.000	0.187	0.281		8881410
820	1.750	2.125	2.000	0.187		0.350	4856000
860	1.750	2.125		0.187		0.297	6955180
842	1.750	2.125	1.995	0.220		0.362	4543300
862	1.750	2.250		0.313			6960080
521	1.875	2.177	2.043	0.107	0.187		8884700
520	1.875	2.250	2.125	0.187	0.281		8887410
521	2.000	2.302	2.178	0.107	0.187		8884810
860	2.000	2.375		0.187		0.297	6955200
842	2.000	2.375	2.245	0.220		0.362	4543200
520	2.000	2.500	2.332	0.250	0.375		8881510
820	2.000	2.500	2.332	0.250		0.450	4837800
862	2.000	2.500		0.313			6960090
521	2.125	2.427	2.303	0.107	0.187		8884900
521	2.250	2.552	2.428	0.107	0.187		8885000
860	2.250	2.625		0.187		0.297	6955220
520	2.250	2.750	2.582	0.250	0.375		8881610
820	2.250	2.750	2.582	0.250		0.450	4856100
862	2.250	2.750		0.313			6960100
521	2.375	2.677	2.553	0.107	0.187		8896800
520	2.375	2.875	2.707	0.250	0.375		8887210
521	2.500	2.802	2.678	0.107	0.187		8885110
860	2.500	2.875		0.187		0.297	6955240
842	2.500	2.875	2.745	0.220		0.362	4708200
520	2.500	3.000	2.832	0.250	0.375		8881710
820	2.500	3.000	2.832	0.250		0.450	4856200

NOTE WL refers to wiper length.

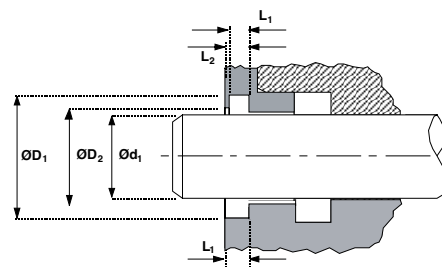
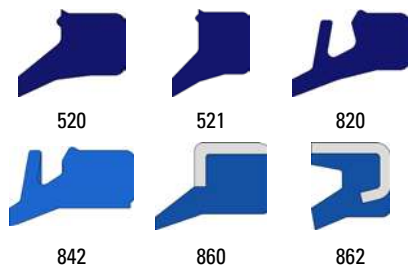


NOMINAL							
TYPE	ϕd_1	ϕD_1	ϕD_2	L_1	L_2	WL	PART No.
862	2.500	3.000		0.313			6960110
521	2.625	2.989	2.803	0.122	0.203		8896900
520	2.625	3.125	2.957	0.250	0.375		4879400
860	2.750	3.125		0.187		0.297	6955260
842	2.750	3.125	2.995	0.220		0.362	4554600
520	2.750	3.250	3.082	0.250	0.375		8881810
862	2.750	3.250		0.313			6960120
521	2.875	3.239	3.084	0.122	0.203		8885300
521	3.000	3.364	3.209	0.122	0.203		8885410
860	3.000	3.375		0.187		0.297	6955280
842	3.000	3.375	3.245	0.220		0.362	4543400
520	3.000	3.500	3.332	0.250	0.375		8881910
820	3.000	3.500	3.332	0.250		0.450	4856300
862	3.000	3.500		0.313			6960130
521	3.125	3.489	3.334	0.122	0.203		8897000
842	3.125	3.500	3.370	0.220		0.362	4543100
842	3.250	3.625	3.495	0.220		0.362	4721400
520	3.250	3.750	3.582	0.250	0.375		8882010
862	3.250	3.750		0.313			6960140
862	3.250	3.875		0.313			6960150
521	3.375	3.729	3.584	0.122	0.203		8885600
842	3.375	3.750	3.620	0.220		0.362	4554700
521	3.500	3.864	3.709	0.122	0.203		8885710
842	3.500	3.875	3.745	0.220		0.362	4818700
520	3.500	4.000	3.832	0.250	0.375		8882110
820	3.500	4.000	3.832	0.250		0.450	4856400
862	3.500	4.000		0.313			6960160
862	3.500	4.125		0.313			6960170
521	3.625	3.989	3.834	0.122	0.203		8885800
842	3.625	4.000	3.870	0.220		0.362	4543000
521	3.750	4.114	3.959	0.122	0.203		8885900
842	3.750	4.125	3.995	0.220		0.362	4708300
520	3.750	4.250	4.082	0.250	0.375		8882210
862	3.750	4.375		0.313			6960180
521	3.875	4.239	4.087	0.122	0.203		8886000
842	3.875	4.250	4.120	0.220		0.362	4523600
520	3.875	4.375	4.207	0.250	0.375		8888810
842	4.000	4.375	4.245	0.220		0.362	4708400

NOTE WL refers to wiper length.

NOMINAL							
TYPE	ϕd_1	ϕD_1	ϕD_2	L_1	L_2	WL	PART No.
521	4.000	4.427	4.240	0.138	0.203		8886110
520	4.000	4.500	4.332	0.250	0.375		8882310
820	4.000	4.500	4.332	0.250		0.450	4856500
862	4.000	4.625		0.313			6960190
862	4.000	4.750		0.313			6960200
862	4.000	5.000		0.500			6960210
521	4.125	4.552	4.365	0.138	0.218		8897100
521	4.250	4.677	4.490	0.138	0.218		8886200
520	4.250	4.750	4.582	0.250	0.375		8882410
842	4.375	4.875	4.715	0.312		0.472	4707800
520	4.500	5.000	4.832	0.250	0.375		8887510
862	4.500	5.125		0.313			6960220
520	4.500	5.250	4.998	0.375	0.562		8882510
820	4.500	5.250	4.998	0.375		0.674	4856600
862	4.500	5.500		0.500			6960230
521	4.750	5.177	4.990	0.138	0.218		8886400
842	4.750	5.250	5.090	0.312		0.472	4547300
520	4.750	5.500	5.248	0.375	0.562		8887310
521	4.875	5.300	5.115	0.138	0.218		8897400
520	4.875	5.625	5.373	0.375	0.562		8881010
521	5.000	5.427	5.240	0.138	0.218		8934510
520	5.000	5.500	5.332	0.250	0.375		8887910
842	5.000	5.500	5.340	0.312		0.472	4708500
862	5.000	5.625		0.313			6960240
520	5.000	5.750	5.498	0.375	0.562		8882610
820	5.000	5.750	5.498	0.375		0.674	4856700
862	5.000	6.000		0.500			6960250
521	5.125	5.552	5.365	0.138	0.218		8886600
521	5.250	5.667	5.490	0.138	0.218		8897500
842	5.250	5.750	5.590	0.312		0.472	4707900
520	5.250	6.000	5.748	0.375	0.562		8882710
521	5.375	5.802	5.615	0.138	0.218		8897600
520	5.500	6.250	5.998	0.375	0.562		8882810
521	5.625	6.114	5.897	0.154	0.250		8897700
521	5.750	6.239	6.022	0.154	0.250		8897800
842	5.750	6.250	6.090	0.312		0.472	4547400
520	5.750	6.500	6.248	0.375	0.562		8889210
520	5.875	6.625	6.373	0.375	0.562		8887010

NOTE WL refers to wiper length.



TYPE	NOMINAL						PART No.
	Ød ₁	ØD ₁	ØD ₂	L ₁	L ₂	WL	
521	6.000	6.489	6.272	0.154	0.250		8934610
520	6.000	6.500	6.332	0.250	0.375		8888010
842	6.000	6.500	6.340	0.312		0.472	4708600
520	6.000	6.750	6.498	0.375	0.562		8882910
820	6.000	6.750	6.498	0.375		0.674	4856800
521	6.250	6.739	6.522	0.154	0.250		8898000
842	6.250	7.000	6.745	0.500		0.740	4708000
521	6.500	6.989	6.772	0.154	0.250		8886900
520	6.500	7.250	6.998	0.375	0.562		8892510
842	6.750	7.250	7.090	0.312		0.472	4547500
520	7.000	7.500	7.332	0.250	0.375		8888310
842	7.000	7.500	7.340	0.312		0.472	4708700
520	7.000	7.750	7.498	0.375	0.562		8883210
842	7.000	7.750	7.495	0.500		0.740	4588400
842	7.000	8.000	7.625	0.500		0.740	4774100
521	7.250	7.739	7.522	0.154	0.250		8898300
521	7.500	7.989	7.772	0.154	0.250		8898400
520	7.500	8.250	7.998	0.375	0.562		8883110
521	7.750	8.239	8.022	0.154	0.250		8898500
842	7.750	8.250	8.090	0.312		0.472	4547600
521	8.000	8.489	8.272	0.154	0.250		8887100

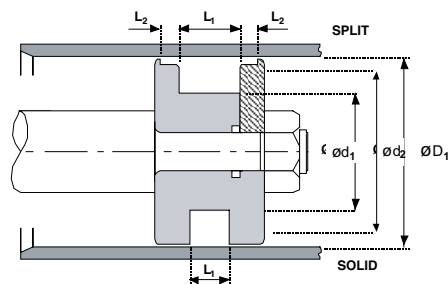
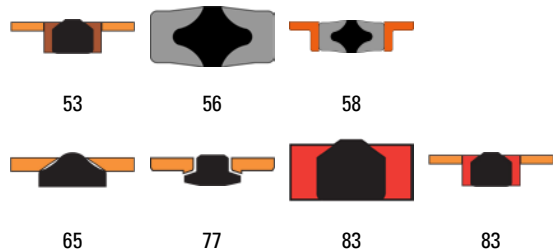
NOTE WL refers to wiper length.

TYPE	NOMINAL						PART No.
	Ød ₁	ØD ₁	ØD ₂	L ₁	L ₂	WL	
842	8.000	8.500	8.340	0.312		0.472	4708800
520	8.000	8.750	8.498	0.375	0.562		8883310
520	8.125	8.625	8.457	0.250	0.375		8888410
520	8.250	9.000	8.748	0.375	0.562		8892410
521	8.500	8.989	8.772	0.154	0.250		8898600
520	8.500	9.250	8.998	0.375	0.562		8888510
842	8.750	9.250	9.090	0.312		0.472	4536700
520	9.000	9.750	9.498	0.375	0.562		8884510
521	9.000	9.989	9.772	0.154	0.250		8898800
520	9.375	9.875	9.707	0.250	0.375		8889110
520	9.500	10.250	9.998	0.375	0.562		8885210
521	10.000	10.489	10.272	0.154	0.250		8898900
520	10.000	11.000	10.664	0.500	0.750		8889610
521	10.500	10.989	10.772	0.154	0.250		8899000
521	11.000	11.489	11.272	0.154	0.250		8899100
520	11.000	11.750	11.498	0.375	0.562		8891310
520	11.000	12.000	11.664	0.500	0.750		8909010
521	11.500	11.989	11.772	0.154	0.250		8899200
520	12.000	13.000	12.664	0.500	0.750		8888610
520	14.000	15.000	14.664	0.500	0.750		8888710
520	15.000	16.000	15.664	0.500	0.750		8889810

NOTE WL refers to wiper length.

PRODUCT INDEX

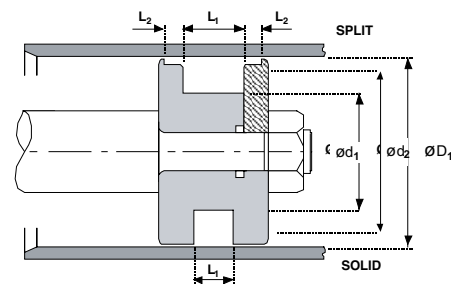
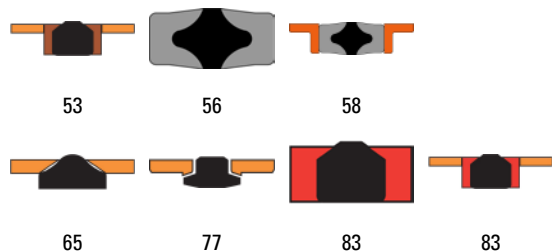
LEGACY DOUBLE-ACTING PISTON SEALS	308
LEGACY SINGLE-ACTING PISTON SEALS	311
LEGACY ROD SEALS	313
LEGACY VEE PACKS	314



NOMINAL						
TYPE	ØD ₁	Ød ₁	Ød ₂	L ₁	L ₂	PART No.
58	1.000	0.625	0.868	0.594	0.187	1247650
65	1.000	0.687	0.829	0.343	0.125	2221210
56	1.250	0.750		0.625		0403740
58	1.250	0.750	1.118	0.750	0.250	0403750
65	1.250	0.937	1.079	0.343	0.125	2221310
77	1.250	0.937	1.079	0.343	0.125	6567790
56	1.500	1.000		0.625		0422440
58	1.500	1.000	1.362	0.625	0.188	6504850
58	1.500	1.000	1.362	0.625	0.254	1441150
58	1.500	1.000	1.371	0.750	0.250	0422450
65	1.500	1.125	1.324	0.437	0.150	2219610
83	1.500	1.125		0.452		6111910
83	1.500	1.125	1.321	0.452	0.250	6111919
58	1.625	1.000	1.428	0.937	0.250	0540650
56	1.750	1.125		0.750		0778240
58	1.750	1.125	1.572	0.750	0.254	6504450
58	1.750	1.125	1.555	0.937	0.250	0778250
65	1.750	1.375	1.574	0.437	0.150	2220910
83	1.750	1.375		0.452		2391410
53	2.000	1.375	1.821	0.750	0.250	6593410
56	2.000	1.375		0.750		0778440
58	2.000	1.375	1.822	0.750	0.254	0639150
58	2.000	1.375	1.805	0.937	0.250	0778450
83	2.000	1.500		0.587		2326310
83	2.000	1.500	1.821	0.587	0.250	2326319
65	2.000	1.625	1.824	0.437	0.150	2224010
58	2.125	1.500	1.928	0.937	0.250	0967650
53	2.250	1.625	2.071	0.750	0.250	6593510
56	2.250	1.625		0.750		1432640
58	2.250	1.625	2.071	0.750	0.254	0640450
58	2.250	1.625	2.055	0.937	0.250	1432650
65	2.250	1.875	2.075	0.437	0.150	2221110
56	2.375	1.750		0.750		0939840
58	2.375	1.750	2.180	0.750	0.250	0890850
58	2.375	1.750	2.180	0.937	0.250	0939850
77	2.375	2.000	2.200	0.437	0.150	6918060
53	2.500	1.875	2.321	0.750	0.250	6593610
56	2.500	1.875		0.750		0867240
58	2.500	1.875	2.321	0.750	0.254	6502250
58	2.500	1.875	2.305	0.937	0.250	0867250

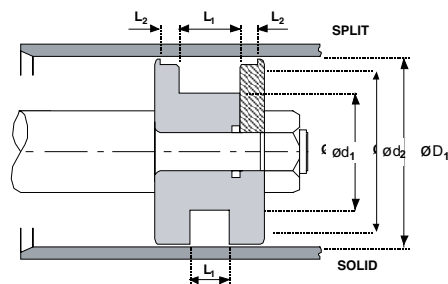
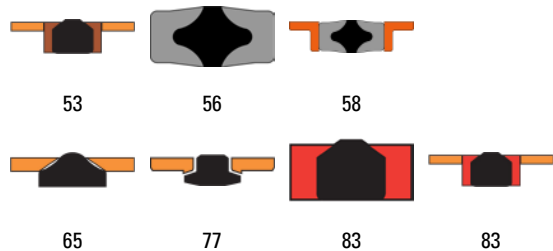
NOMINAL						
TYPE	ØD ₁	Ød ₁	Ød ₂	L ₁	L ₂	PART No.
83	2.500	2.000		0.587		2122010
83	2.500	2.000	2.321	0.587	0.250	2122019
65	2.500	2.125	2.325	0.437	0.150	2224110
77	2.500	2.125	2.325	0.437	0.150	2360210
58	2.625	2.000	2.428	0.937	0.250	1371050
53	2.750	2.000	2.524	0.937	0.250	6593710
56	2.750	2.000		0.937		1369140
58	2.750	2.000	2.524	0.937	0.254	0783250
58	2.750	2.000	2.485	1.187	0.250	1369150
65	2.750	2.375	2.575	0.437	0.150	2219510
56	2.875	2.125		0.937		0779640
58	2.875	2.125	2.610	1.187	0.250	0779650
65	2.875	2.500	2.700	0.437	0.150	2225210
53	3.000	2.250	2.774	0.937	0.250	1377612
56	3.000	2.250		0.937		1098440
58	3.000	2.250	2.774	0.937	0.254	6502450
58	3.000	2.250	2.735	1.187	0.250	1098450
83	3.000	2.500		0.587		2122110
83	3.000	2.500	2.774	0.587	0.250	2122119
65	3.000	2.625	2.825	0.437	0.150	2224210
58	3.125	2.375	2.858	1.187	0.250	1024850
53	3.250	2.500	3.023	0.937	0.250	6593910
56	3.250	2.500		0.937		0782440
58	3.250	2.500	3.024	0.937	0.254	1154150
58	3.250	2.500	2.985	1.187	0.250	0782450
83	3.250	2.750		0.587		2327610
83	3.250	2.750	3.023	0.587	0.250	2327619
65	3.250	2.875	3.075	0.437	0.150	2219710
77	3.250	2.875	3.270	0.437	0.150	2360310
53	3.500	2.750	3.274	0.937	0.250	0082412
56	3.500	2.750		0.937		0437840
58	3.500	2.750	3.273	0.937	0.254	6500550
58	3.500	2.750	3.235	1.187	0.250	0437850
65	3.500	3.000	3.270	0.562	0.210	0177610
83	3.500	3.000		0.587		2122210
83	3.500	3.000	3.274	0.587	0.250	2122219
58	3.625	2.875	3.360	1.187	0.250	1474550
53	3.750	3.000	3.524	0.937	0.250	2361010
56	3.750	3.000		0.937		0410540
58	3.750	3.000	3.485	1.187	0.250	0410550



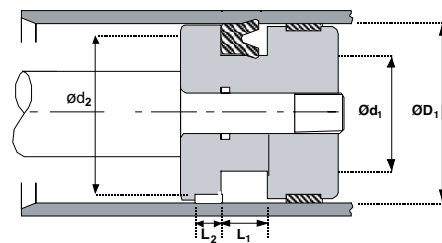
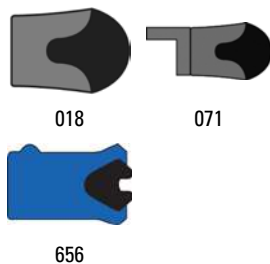


NOMINAL						
TYPE	ØD ₁	Ød ₁	Ød ₂	L ₁	L ₂	PART No.
65	3.750	3.250	3.520	0.562	0.210	0178810
58	3.875	3.125	3.610	1.187	0.250	0295850
56	4.000	3.250		0.719		6504740
83	4.000	3.250		0.780		2326410
83	4.000	3.250	3.773	0.780	0.250	2326419
53	4.000	3.250	3.773	0.937	0.250	0082313
56	4.000	3.250		0.937		1407740
58	4.000	3.250	3.772	0.937	0.254	6504750
58	4.000	3.250	3.735	1.187	0.250	1407750
65	4.000	3.500	3.770	0.562	0.210	1172310
53	4.250	3.500	4.024	0.937	0.250	0082211
56	4.250	3.500		0.937		1128840
58	4.250	3.500	4.022	0.937	0.254	6504550
58	4.250	3.500	3.985	1.187	0.250	1128850
65	4.250	3.750	4.020	0.562	0.210	0309210
53	4.500	3.500	4.232	1.250	0.250	6594210
56	4.500	3.500		1.250		0448840
58	4.500	3.500	4.231	1.250	0.254	6504250
58	4.500	3.500	4.234	1.500	0.375	0448850
83	4.500	3.750		0.780		2360410
83	4.500	3.750	4.232	0.780	0.250	2360419
65	4.500	4.000	4.270	0.562	0.210	0418910
56	4.625	3.625		1.250		0449040
53	4.750	3.750	4.463	1.250	0.375	2360910
56	4.750	3.750		1.250		1007040
58	4.750	3.750	4.483	1.250	0.254	0038250
58	4.750	3.750	4.485	1.500	0.375	1007050
65	4.750	4.250	4.520	0.562	0.210	1155810
53	5.000	4.000	4.712	1.250	0.375	6594310
56	5.000	4.000		1.250		0443040
58	5.000	4.000	4.730	1.250	0.254	6500650
58	5.000	4.000	4.735	1.500	0.375	0443050
83	5.000	4.250		0.780		2326510
83	5.000	4.250	4.713	0.780	0.375	2326519
65	5.000	4.375	4.689	0.687	0.344	1175410
56	5.250	4.250		1.250		0892240
58	5.250	4.250	4.980	1.500	0.375	0892250
65	5.250	4.625	4.938	0.687	0.344	1173710
53	5.500	4.500	5.213	1.250	0.375	6594410
56	5.500	4.500		1.250		0133240

NOMINAL						
TYPE	ØD ₁	Ød ₁	Ød ₂	L ₁	L ₂	PART No.
58	5.500	4.500	5.235	1.250	0.254	6504150
58	5.500	4.500	5.236	1.500	0.375	0133250
65	5.500	4.875	5.188	0.687	0.344	1173610
58	5.750	4.750	5.484	1.500	0.375	1366950
53	6.000	5.000	5.713	1.250	0.375	6594510
56	6.000	5.000		1.250		1367040
58	6.000	5.000	5.728	1.250	0.254	0557950
58	6.000	5.000	5.736	1.500	0.375	1367050
83	6.000	5.250		0.780		2326610
83	6.000	5.250	5.713	0.780	0.375	2326619
65	6.000	5.250	5.712	1.000	0.500	0300110
58	6.250	5.250	5.984	1.500	0.375	0083350
56	6.500	5.500		1.250		1164140
58	6.500	5.500	6.236	1.500	0.375	1164150
65	6.500	5.750	6.212	1.000	0.500	0047010
58	6.750	5.750	6.484	1.500	0.375	1286150
56	7.000	6.000		1.250		1188840
58	7.000	6.000	6.736	1.500	0.375	1188850
83	7.000	6.250		0.780		2361910
83	7.000	6.250	6.673	0.780	0.500	2361919
65	7.000	6.250	6.712	1.000	0.500	0314110
56	7.250	6.000		1.625		0424140
56	7.500	6.250		1.625		1255240
58	7.500	6.250	7.240	1.875	0.375	1255250
56	8.000	6.750		1.625		0426540
56	8.000	7.000		1.000		0224340
58	8.000	7.000	7.740	1.250	0.375	0224350
83	8.000	7.250		0.780		2361710
83	8.000	7.250	7.685	0.780	0.500	2361719
65	8.000	7.250	7.712	1.000	0.500	0045110
56	8.250	7.000		1.625		1219240
56	8.500	7.250		1.625		1286440
56	9.000	7.750		1.625		1266640
58	9.000	7.750	8.740	1.875	0.375	1266650
58	9.000	8.000	8.736	1.250	0.375	1273750
65	9.000	8.250	8.712	1.000	0.500	0045510
56	9.250	8.000		1.625		0455740
56	9.500	8.250		1.625		1332240
56	9.750	8.500		1.625		1332340
56	10.000	8.750		1.625		0436140

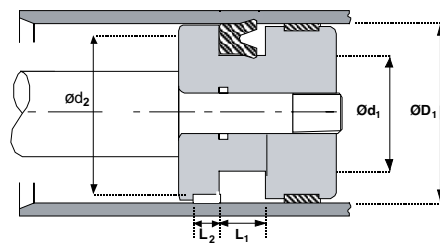
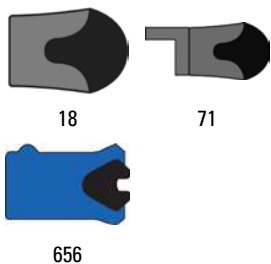


TYPE	NOMINAL					PART No.
	ØD_1	Ød_1	Ød_2	L_1	L_2	
58	10.000	9.000	9.740	1.250	0.375	0697650
56	10.500	9.250		1.625		1331940
56	10.750	9.500		1.625		1320440
56	11.000	9.750		1.625		0433940
56	11.500	10.250		1.625		1331640
56	12.000	10.750		1.625		1331440
56	13.250	12.000		1.625		1329140
56	14.500	13.000		1.500		0270940
56	15.000	13.750		1.500		0787040
56	16.000	14.750		1.800		2117440
56	19.500	18.000		2.500		2108240
56	20.000	18.500		1.750		2111240



NOMINAL							
TYPE	ØD ₁	Ød ₁	Ød ₂	SL	L ₁	L ₂	PART No.
18	0.750	0.375			0.281		1379300
18	0.875	0.500			0.281		0406700
18	0.875	0.625			0.187		1435600
18	1.000	0.625			0.281		1247600
71	1.000	0.625	0.868		0.343	0.187	1247610
18	1.093	0.750			0.281		1364200
18	1.250	0.750			0.375		0403700
71	1.250	0.750	1.118		0.437	0.250	0403710
18	1.375	0.875			0.375		0401300
71	1.375	0.875	1.238		0.437	0.250	0401310
18	1.375	1.000			0.250		0282600
18	1.500	1.000			0.375		0422400
71	1.500	1.000	1.371		0.437	0.250	0422410
18	1.625	1.125			0.375		0287000
18	1.625	1.250			0.281		0282400
18	1.750	1.125			0.437		0778200
71	1.750	1.125	1.555		0.531	0.250	0778210
18	1.875	1.250			0.437		0404100
18	2.000	1.375			0.437		0778400
71	2.000	1.375	1.805		0.531	0.250	0778410
18	2.000	1.500			0.281		1447800
656	2.000	1.625		0.273	0.300		4579200
18	2.125	1.500			0.437		0967600
18	2.250	1.625			0.437		1432600
71	2.250	1.625	2.055		0.531	0.250	1432610
18	2.250	1.750			0.312		1404300
18	2.375	1.750			0.437		0939800
18	2.500	1.875			0.437		0867200
71	2.500	1.875	2.305		0.531	0.250	0867210
656	2.500	1.875		0.500	0.550		4522700
18	2.625	2.000			0.437		1371000
71	2.625	2.000	2.428		0.531	0.250	1371010
656	2.625	2.250		0.273	0.300		4579100
18	2.750	2.000			0.562		1369100
71	2.750	2.000	2.485		0.687	0.250	1369110
18	2.875	2.250			0.437		0424300
18	3.000	2.250			0.562		1098400
71	3.000	2.250	2.735		0.687	0.250	1098410
18	3.000	2.500			0.312		0641200

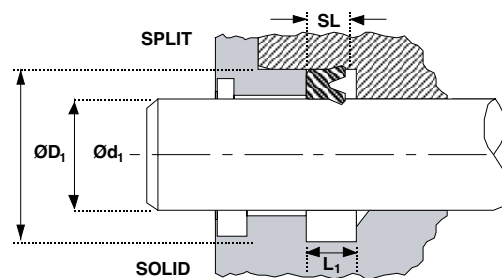
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TYPE	ØD ₁	Ød ₁	Ød ₂	SL	L ₁	L ₂	PART No.
18	3.250	2.500			0.562		0782400
71	3.250	2.500	2.985		0.687	0.250	0782410
656	3.250	2.500		0.625	0.688		4456700
18	3.500	2.750			0.562		0437800
71	3.500	2.750	3.235		0.687	0.250	0437810
656	3.500	2.750		0.625	0.687		4461300
18	3.750	3.000			0.562		0410500
71	3.750	3.000	3.485		0.687	0.250	0410510
18	4.000	3.250			0.562		1407700
71	4.000	3.250	3.735		0.687	0.250	1407710
656	4.000	3.250		0.625	0.687		4522800
18	4.000	3.500			0.375		1468200
18	4.250	3.500			0.562		1128800
71	4.250	3.500	3.985		0.687	0.250	1128810
71	4.500	3.500	4.234		0.875	0.375	0448810
18	4.500	3.750			0.500		1414800
656	4.500	3.750		0.625	0.687		4461400
71	4.750	3.750	4.485		0.875	0.375	1007010
18	4.875	4.000			0.656		1424100
18	5.000	4.000			0.750		0443000
71	5.000	4.000	4.735		0.875	0.375	0443010
656	5.000	4.250		0.625	0.687		4522900
18	5.250	4.250			0.750		0892200
71	5.250	4.250	4.985		0.875	0.375	0892210
18	5.250	4.500			0.469		0447800
18	5.500	4.500			0.750		0133200
71	5.500	4.500	5.236		0.875	0.375	0133210
656	5.500	4.750		0.625	0.687		4461500
18	6.000	5.000			0.750		1367000
71	6.000	5.000	5.736		0.875	0.375	1367010
18	6.000	5.250			0.562		0487700
656	6.000	5.250		0.625	0.687		4523000
18	6.500	5.500			0.750		1164100
71	6.500	5.500	6.236		0.875	0.375	1164110
656	6.500	5.750		0.625	0.687		4523100
18	7.000	6.000			0.750		1188800
71	7.000	6.000	6.736		0.875	0.375	1188810
18	7.750	6.500			1.000		1192700
18	8.000	7.000			0.875		6501200



TYPE	NOMINAL						PART No.
	ϕD_1	ϕd_1	ϕd_2	SL	L_1	L_2	
18	8.250	7.000			1.000		1219200
18	8.750	7.500			1.000		0418100
18	9.000	8.000			0.750		1269400
18	9.250	8.000			1.000		0455700
18	9.750	8.500			1.000		1332300
18	10.250	9.000			1.000		0437500
18	10.750	9.500			1.000		1320400
18	11.250	10.000			1.000		0452200
18	11.750	10.500			1.000		1331300
18	12.250	11.000			1.000		1331000
18	13.250	12.000			1.000		1329100
18	14.250	13.000			1.000		0864800
18	15.250	14.000			1.208		0174900
18	16.000	14.500			1.500		1345000
18	17.000	15.000			1.500		1345300
18	17.750	16.500			1.000		1318800
18	17.750	17.000			0.625		1345900
18	19.250	18.000			1.250		1314500
18	20.750	19.000			1.312		1342200
18	21.500	20.000			1.750		0093600
18	31.500	30.000			1.125		1337900
18	32.000	30.000			1.500		2109700
18	39.500	38.000			1.125		0159200

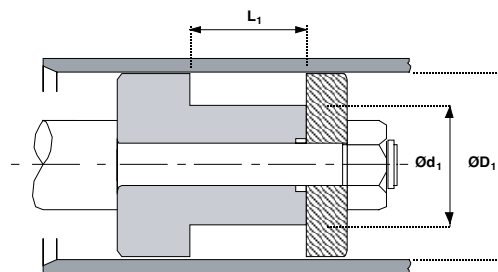
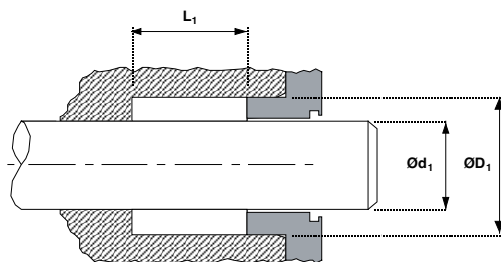


18



NOMINAL				
TYPE	Ød ₁	ØD ₁	SL	PART No.
18	0.375	0.750	0.281	1379300
18	0.500	0.875	0.281	0406700
18	0.625	0.875	0.187	1435600
18	0.625	1.000	0.281	1247600
18	0.750	1.093	0.281	1364200
18	0.750	1.250	0.375	0403700
18	0.875	1.375	0.375	0401300
18	1.000	1.375	0.250	0282600
18	1.000	1.500	0.375	0422400
18	1.125	1.625	0.375	0287000
18	1.125	1.750	0.437	0778200
18	1.250	1.625	0.281	0282400
18	1.250	1.875	0.437	0404100
18	1.375	2.000	0.437	0778400
18	1.500	2.000	0.281	1447800
18	1.500	2.125	0.437	0967600
18	1.625	2.250	0.437	1432600
18	1.750	2.250	0.312	1404300
18	1.750	2.375	0.437	0939800
18	1.875	2.500	0.437	0867200
18	2.000	2.625	0.437	1371000
18	2.000	2.750	0.562	1369100
18	2.250	2.875	0.437	0424300
18	2.250	3.000	0.562	1098400
18	2.500	3.000	0.312	0641200
18	2.500	3.250	0.562	0782400
18	2.750	3.500	0.562	0437800
18	3.000	3.750	0.562	0410500
18	3.250	4.000	0.562	1407700
18	3.500	4.000	0.375	1468200
18	3.500	4.250	0.562	1128800
18	3.750	4.500	0.500	1414800
18	4.000	4.875	0.656	1424100
18	4.000	5.000	0.750	0443000
18	4.250	5.250	0.750	0892200
18	4.500	5.250	0.469	0447800
18	4.500	5.500	0.750	0133200
18	5.000	6.000	0.750	1367000
18	5.250	6.000	0.562	0487700

NOMINAL				
TYPE	Ød ₁	ØD ₁	SL	PART No.
18	5.500	6.500	0.750	1164100
18	6.000	7.000	0.750	1188800
18	6.500	7.750	1.000	1192700
18	7.000	8.000	0.875	6501200
18	7.000	8.250	1.000	1219200
18	7.500	8.750	1.000	0418100
18	8.000	9.000	0.750	1269400
18	8.000	9.250	1.000	0455700
18	8.500	9.750	1.000	1332300
18	9.000	10.250	1.000	0437500
18	9.500	10.750	1.000	1320400
18	10.000	11.250	1.000	0452200
18	10.500	11.750	1.000	1331300
18	11.000	12.250	1.000	1331000
18	12.000	13.250	1.000	1329100
18	13.000	14.250	1.000	0864800
18	14.000	15.250	1.208	0174900
18	14.500	16.000	1.500	1345000
18	15.000	17.000	1.500	1345300
18	16.500	17.750	1.000	1318800
18	17.000	17.750	0.625	1345900
18	18.000	19.250	1.250	1314500
18	19.000	20.750	1.312	1342200
18	20.000	21.500	1.750	0093600
18	30.000	31.500	1.125	1337900
18	30.000	32.000	1.500	2109700
18	38.000	39.500	1.125	0159200



NOMINAL				
TYPE	Ød ₁	ØD ₁	SL	PART No.
09	0.500	1.000	0.715	6530830
09	0.750	1.250	0.875	1735140
09	0.875	1.375	0.825	4135930
09	1.000	1.375	0.675	4138630
09	1.000	1.500	0.710	0183330
07	1.000	1.500	0.750	0820120
07	1.125	1.625	0.750	0379320
09	1.125	1.625	0.775	4136030
09	1.125	1.750	1.065	4115330
07	1.250	1.750	0.750	0821420
09	1.250	1.750	0.785	4102530
09	1.500	2.000	0.710	4007630
07	1.500	2.000	0.750	0618620
09	1.500	2.125	1.000	4002130
07	1.625	2.125	0.750	0206420
07	1.750	2.250	0.750	0889320
09	1.750	2.250	0.825	1461530
09	1.750	2.375	1.000	4135130
09	1.875	2.500	0.950	4136230
09	2.000	2.500	0.715	4007430
07	2.000	2.500	0.750	0617220
09	2.000	2.625	0.898	6557940
09	2.000	2.750	0.986	6575730
09	2.250	2.750	0.705	6555230
07	2.250	2.750	0.750	6630620
09	2.250	2.875	0.937	6530730
09	2.250	3.000	0.960	4008030
07	2.375	3.000	0.937	0207220
09	2.375	3.000	0.990	4129530
09	2.500	3.000	0.777	0334330
09	2.500	3.125	0.961	4122230
09	2.500	3.125	1.000	0819220
09	2.500	3.250	1.222	4002530
09	2.750	3.250	0.795	4182430
07	2.750	3.375	1.000	0819920
09	2.750	3.500	0.978	4008430
09	3.000	3.500	0.725	4130730

NOMINAL				
TYPE	Ød ₁	ØD ₁	SL	PART No.
09	3.000	3.625	0.918	4001530
07	3.000	3.625	1.000	0893020
09	3.000	3.750	1.159	0636930
09	3.250	4.000	0.960	4008330
07	3.250	4.000	1.125	0207320
09	3.375	4.000	0.833	4002730
09	3.375	4.125	1.236	4134030
09	3.500	4.000	0.825	1461130
09	3.500	4.250	1.086	4115830
07	3.500	4.250	1.125	0818420
09	3.750	4.375	0.900	1365330
09	3.750	4.500	1.090	0755731
07	3.750	4.500	1.125	1014420
09	3.875	4.500	0.878	4001930
09	4.000	4.500	0.775	6565930
09	4.000	4.750	1.000	6573130
07	4.000	4.750	1.125	1356620
09	4.000	5.000	1.440	0563630
09	4.250	5.000	1.090	0299330
07	4.500	5.250	1.125	0354120
09	5.000	6.000	1.765	0307530
09	5.250	6.000	1.055	0411130
09	5.500	6.500	1.175	0048430
09	6.000	6.500	0.675	1207030

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Hallite operations can be found in strategic geographies throughout Asia Pacific, Western Europe, and North America. Combining an expansive global footprint with a dense network of strategic service partners completes our global presence; ensuring that the full range of Hallite products, capabilities, and expertise are always available when and where you need them most.



WWW.HALLITE.COM

AUSTRALIA

Hallite Seals Australia Pty. Ltd.
Unit 2, 1A Bessemer Street
Blacktown
NSW 2148
T: +61(02) 8886 1600
F: +61(02) 8886 1650
seals@hallite.com.au

INDIA

Hallite Sealing Solutions India
Pvt. Ltd.
Special Plot No.10, 3rd Main
1st Stage Peenya Industrial Estate
Bangalore 560058
T: +91(0) 80 2372 6000
F: +91(0) 80 2372 6002
seals@hallite.in

CANADA

Hallite Seals (Canada) Ltd.
5630 Kennedy Road
Mississauga, Ontario
L4Z 2A9
T: +1 (905) 361 2350
F: +1 (905) 361 2342
sales@hallite.ca

ITALY

Hallite Italia srl
Via Francia 21
Loc. Guasticce
57017 Collesalvetti – Livorno
T: +39 (0) 58 642 8287
F: +39 (0) 58 642 9845
seals@hallite.it

CHINA

Hallite Sealing Technology
(Shanghai) Co., Ltd.
785 Xing Rong Road
North Industrial Development Zone
Jiading District
Shanghai 201807
T: +86 (0) 21 3351 7272
F: +86 (0) 21 3351 7085
hallite.shanghai@hallite.com

UNITED KINGDOM

Hallite Seals International Ltd.
130 Oldfield Road
Hampton, Middlesex
TW12 2HT
T: +44 (0)20 8941 2244
F: +44 (0) 20 8783 1669
seals@hallite.com

GERMANY

Dichtelemente Hallite GmbH
Billwerder Ring 17
21035 Hamburg
T: +49 (0) 40 73 47 48-0
F: +49 (0) 40 73 47 48 49
seals@hallite.de

UNITED STATES

Hallite Seals Americas, Inc.
50777 Varsity Court
Wixom, MI 48393
T: +1 (248) 668 5200
F: +1 (248) 668 5210
sales@hallite.us